THE RELATIONSHIP AMONG BUSINESS INTELLIGENCE SYSTEMS ADOPTION, INFORMATION TECHNOLOGY INFRASTRUCTURE, INNOVATION AND COMPETITIVE ENVIRONMENT ON PERFORMANCE OF BANKS IN MALAYSIA

By

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Thesis Submitted to
School of Business Management,
Universiti Utara Malaysia,
in Fulfillment of the Requirement for the Degree of Doctor of Philosophy

Pusat Pengajian Pengurusan Perniagaan
(School of Business Management)

Kolej Perniagaan
(College of Business)

Universiti Utara Malaysia

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Program Pengajian *(Programme of Study)*	:	**Doctor of Philosophy**
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ABSTRACT

This study was conducted to determine the relationship by providing a framework that integrates business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and the performance of Malaysian banking institutions. This study focused on banks in Malaysia where the identified unit of analysis was the organisation represented by their managers. The views of knowledge-based, the resource-based theory and contingency theory were underpinned in this study. The Statistical Package for Social Science (SPSS) and Partial Least Squares (PLS) approach to structural equation modelling (SEM) via Smart PLS 3.0 software were employed in this study. A total of 177 samples were deemed usable which resulted in an effective response rate of 16.93 percent. The current study clarifies how business intelligence systems adoption and information technology infrastructure both directly and indirectly predict innovation and performance outcomes. This research also highlighted the relationship between innovation and performance as moderation factors of competitive environment. The findings indicated that out of the 8 hypotheses inferred, 7 hypotheses were found to be supported, while one hypothesis was the contrary. The results obtained for the hypothesis depicted the positive significant relationship between business intelligence systems adoption and performance, information technology infrastructure and performance, business intelligence systems adoption and innovation, information technology infrastructure and innovation, and, innovation and performance, was supported (H1, H2, H3, H4, and H5). Innovation does partially mediate the relationship between business intelligence systems adoption and performance (H6), and also innovation does partially mediate the relationship between information technology infrastructure and performance (H7). Competitive environment does not moderate the relationship between innovation and performance (H8). This study proposed several practical suggestions to banking institutions on how employees can innovate when enhancing their business intelligence systems adoption and information technology infrastructure to improve performance among them. The management should provide a platform for the employees to enhance their innovativeness through the implementation of business intelligence systems adoption and information technology infrastructure. Furthermore, performance can be improved if the management focuses heavily on increasing innovation among employees. The major contribution of the current study is the proposed model for measuring the performance of banking institutions in Malaysia. The performance of these institutions is fundamental as they contribute significantly to the nation's economy.

Keywords: business intelligence systems adoption, information technology infrastructure, innovation, competitive environment and performance

ABSTRAK

Kajian ini dijalankan untuk menentukan hubungan penggunaan sistem kecerdasan perniagaan, infrastruktur teknologi maklumat, inovasi, persekitaran yang berdaya saing, dan prestasi institusi perbankan Malaysia dengan menyediakan satu kerangka kerja yang menggabungkan kesemua faktor-faktor tersebut. Kajian ini memberi tumpuan kepada bank-bank di Malaysia dengan unit analisis yang dikenal pasti sebagai organisasi yang diwakili oleh para pengurus mereka. Kajian ini dijalankan berdasarkan pandangan berasaskan pengetahuan, teori berasaskan sumber dan teori kontigensi, *Statistical Package for Social Science* (SPSS) dan kaedah *Partial Least Squares* (PLS) untuk Model Persamaan Berstruktur (SEM) dengan perisian Smart PLS 3.0 digunakan dalam kajian ini. Sebanyak 177 sampel didapati boleh digunakan dengan kadar keberkesanan maklum balas sebanyak 16.93 peratus. Kajian ini menjelaskan bagaimana penggunaan sistem kecerdasan perniagaan dan infrastruktur teknologi secara langsung dan tidak langsung meramalkan hasil inovasi dan prestasi. Kajian ini juga menekankan hubungan antara inovasi dan prestasi sebagai faktor penyederhana persekitaran yang berdaya saing. Hasil kajian menunjukkan 7 daripada 8 hipotesis yang disimpulkan disokong manakala satu daripada hipotesis tersebut sebaliknya. Hasil yang diperoleh bagi hipotesis menggambarkan hubungan positif yang signifikan antara penggunaan sistem kecerdasan perniagaan dan prestasi, infrastruktur teknologi dan prestasi, penggunaan sistem kecerdasan perniagaan dan inovasi, infrastruktur teknologi maklumat dan inovasi, dan, inovasi dan prestasi disokong (H1, H2, H3, H4 dan H5). Inovasi mengantara secara separa hubungan antara penggunaan sistem kecerdasan perniagaan dan prestasi (H6), dan inovasi juga mengantara secara separa hubungan antara infrastruktur teknologi maklumat dan prestasi (H7). Persekitaran persaingan tidak menyederhanakan hubungan antara inovasi dengan prestasi (H8). Kajian ini mencadangkan beberapa amalan kepada pekerja institusi perbankan untuk berinovasi ketika mempertingkatkan penggunaan sistem kecerdasan perniagaan dan infrastruktur teknologi bagi meningkatkan prestasi dalam kalangan mereka. Pihak pengurusan perlu menyediakan platform kepada pekerja untuk meningkatkan inovasi mereka melalui pelaksanaan penggunaan sistem kecerdasan perniagaan dan infrastruktur teknologi maklumat. Selain itu, prestasi dapat ditingkatkan sekiranya pihak pengurusan memberi tumpuan kepada peningkatan inovasi dalam kalangan pekerja. Kajian ini menyumbang kepada penggunaan model yang dicadangkan untuk mengukur prestasi institusi perbankan di Malaysia. Prestasi institusi tersebut penting kerana sumbangannya yang signifikan kepada enonomi negara.

Kata kunci: penggunaan sistem kecerdasan perniagaan, infrastruktur teknologi maklumat, inovasi, persekitaran yang berdaya saing dan prestasi

ACKNOWLEDGEMENT

Alhamdulillah, praise be to Allah SWT, the Most Merciful, and the Most Compassionate. I would like to offer my humblest gratitude to the Prophet Muhammad SAW whose teaching flourished my thoughts and enlightened my heart. I am so grateful to Allah for granting me the chance, the strength, determination, and perseverance to complete this doctoral program, which has uplifted me into heights of intellectual, spiritual, and emotional enrichment.

My deepest gratitude goes to my supervisor, Dr. Muhammad Shukri bin Bakar, for his sustained commitment, guidance, patience, and encouragement. I would also like to take this opportunity to thanks Prof. Dr. Rosli bin Mahmood, Prof. Dr. Zainal Abidin Mohamed, Assoc. Prof. Dr. Rosmah Mat Isa, Assoc. Prof. Dr. Azizi Abu Bakar, Assoc. Prof. Dr. Kalsom Abdul Wahab, Dr. Rosli bin Mohd. Saad, and Dr. Mazlina binti Mamat for their input, ideas, and help.

I would like to record my special thanks to my superiors and colleagues at the Faculty of Economics and Muamalat (FEM) and the Centre for Core Studies (PPT), Universiti Sains Islam Malaysia, for providing me with encouragement and the opportunity to embark on this Ph.D. journey. Also, many thanks go to all the managers and friends in banking institutions who kindly helped me with the data collection.

I wish to dedicate my thesis to my late mother Maimunah binti Hat for her love, prayers, and support, and to my late father Ismail bin Md Yatim who taught me the value of hard work, and the virtue of patience and sacrifices. My sincere gratitude goes to my mother-in-law, Suboon binti Ahmad, my late father-in-law, Harun bin Bakar, my sister, Che Inson, my brothers, Berhannordin and Bahren, and my late brother Halim as well as in-laws for their constant prayers.

Last but not least, I am forever indebted to my beloved family, especially my lovely husband, Sharbani bin Harun, as well as to my sons, Ashran, Asfahanee, Assfil, and my daughter, Alya Syarafana, for their endless love, patience and continued support throughout those difficult years of the doctoral journey.

Finally, to those whom I could not write their names here but have crossed my path and enlightened my life, supported me and made my Ph.D. journey a meaningful one, I wish to say, “Thank You Very Much” and may Allah bless you always.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AVE	Average Variance Exracted
BI	Business Intelligence
BIMB	Bank Islam Malaysia Berhad
CA	Competitive Advantage
CAMEL	Capital, Asset, Management, Efficiency and Liquidity
CBU	Complete Built-Up
CE	Competitive Environment
CI	Competitive Intelligence
CIOs	Chief Information Officer’s
CIS	Community Innovation Survey
CR	Composite Reliability
CSP	Corporate Social Performance
CPU	Central Processing Unit
DEA	Data Employment Analysis
DFIs	Development Financial Institutions
DTI	Department of Trade and Industry
EIS	Executive Information Systems
ES	Enterprise Systems
GIA	Global Intelligence Alliance
I	Innovation
IT	Information Technology
LLCI	Lower Limit Confidence Level
MCA	Missing Value Analysis
MIS	Management Information Study
OECD	Organisation for Economic Cooperation and Development
P	Performance

PLS	Partial Least Square
PLS-SEM	Partial Least Square-Structural Equation Modelling
RBT	Resource-Based Theory
ROA	Return on Asset
ROS	Return on Sales
SOA	Service Oriented Architecture
SPSS	Statistical Package for Social Sciences
UCLI	Upper Limit Confidence Level
VAF	Variance Accounted Factor

LIST OF APPENDICES

CHAPTER ONE

INTRODUCTION

1.0 Introduction of the Study

This chapter begins with the background of the study and highlights the importance of studying business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance. The discussion proceeds with the background of the study, problem statements, research questions, research objectives, definitions of the key terms, organisation of the thesis, and chapter summary.

1.1 Background of the Study

The performance of the company lends from the organisational strength of the company (Campbell, 1977; Karanja, 2011; Kirchoff, 1977; Steers, 1975, 1977). Due to its importance, researchers and practitioners have invested extensive attention and focus over the last decades to understand the components that contributed to the cause of organisational performance. The focus was also aimed to research how some variables and their mechanism can affect organisational performance, either giving favourable effect or otherwise (Jing & Avery, 2008).

In the context of the banking institutions, the performance of the banks is affected by the global financial crises and rapid changes in the country's financial (Kasasbeh, Harada, & Noor, 2017). There are generally four main challenges faced by banks and financial institutions to keep up with the rapid changes in the industry (Schubert, 2015). First, banks and financial institutions are not making sufficient money or profit, although there are headlines about banking profitability everywhere. Banks and financial institutions still cannot produce enough return on investment or return on equity that shareholders demand. Second, customers are demanding more than what they can deliver, particularly in terms of technology. Third, there is an increasing competition coming from financial technology companies such as FinTech. FinTech companies are commonly start-up that primarily use computer software to provide financial services. This increasing popularity has disrupted the way traditional banks work. Fourth, regulatory requirements have continued to increase, and banks need to spend a huge amount of money to comply with all rules and regulations set by authorities. Likewise, banks and financial institutions are required to build system or information technology infrastructure as part of these requirements. Hence, the business environment today is extremely competitive.

The rapid change in the banking institutions forces them to face challenge scenarios (Schubert, 2015; Kasasbeh et al., 2017). A continuance in changing of customers' demand and preferences, for instance, had caused the banking institutions to face an intense competition, which eventually pushing the banks to implement an innovation in their various offering opportunities (Al-Mansour, 2007; Peschel, 2008). Moreover, customers are more knowing and better informed; hence, requires banks to lead on innovative strategies and facilitate attitude, thinking, and behaviour to ensure not left behind (Al-Swidi & Mahmood, 2011; Sebora, Theerapatuong, & Lee, 2010). Furthermore, with the ongoing changing of customer's demand and preferences together with the development in information technology, banking is faced with intense competition that urge them offers various products and services (Al-Mansour, 2007; Peschel, 2008; Suratno, 2013). Consequently, banks must integrate all the customer's needs, feedback and expectations as the cardinal in the product design so that the products or services offered are innovative and delivers high quality (Al-Swidi & Mahmood, 2011; Wright, Eid, & Fleisher, 2009). However, in order to be innovative, banks must always have knowledge and take advantage of the data and advance data analytics to present new innovations in their products and services.

It was acknowledged that, to assist organisations better understand its business and market and make timely business decision (Chen, Chiang, & Storey, 2012), advanced data analytics through business intelligence system is utilised by organisations to cater the pressing demands for increasing competitor insights and the competition themselves (Cetorelli, 1999; Wright et al., 2009). For instance, banks are adopting a business intelligence system to assess the strategic opportunities in locating the regions which have demographic and economic attributes, besides identifying a suitable enterprise which potentially to become a business partner, joint venture or merge in their effort for market expansion in the identified areas (Vella & McGonagle, 1986; Owusu, 2017). Hence, the business intelligence becomes one of the most important revolutions within the banking system in these transformation initiatives.

Nevertheless, innovation and business intelligence rely heavily on information technology infrastructure. Information technology is important in innovation as it helps automating tasks and improving efficiency of many steps in the new product development process (Atuahene-Gima 2005, Zhou, Yim & Tse 2005). In addition, information technology is viewed as a valuable resource that an organisation uses for its innovation needs, which in turn lead to the performance of the organisation (Yang, Chen, & Wang, 2012; Karanja, 2011; Venkatraman & Ramanujam, 1986).

Based on the above justification, the present study intends to link the business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment for organisational performance. To the researcher' understanding, there is no study that links these important elements together into an integrated framework in understanding performance. Therefore, it is desired that this study will contribute to the strategic management and information technology literatures by providing a framework that integrate business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment to better improving organisational performance among banking institution.

1.2 Problem Statements

First, organisational performance has been identified as one of the most important variables in management research that have been defined differently over the years due to its many meanings (Gavrea, Ilies, & Stegerean, 2011). Existing literature in business and management have shown that the value of organisational performance were limited to only financial measures, such as the return on investment (ROI), net present value (NPV) and the return on assets (ROA) (Hunton, Lippincott, & Reck, 2003; Martinsons, Davison, & Tse, 1999; Nicolaou, 2004; Poston & Grabski, 2001, Owusu, 2017). It is obvious that most of these studies focused on the financial measures. Hou, Xue, and Zhang, (2015) contended that these fiscal criteria which were applicable to some early research, cannot be used on some recent novel systems which provides a set of intangible benefits including improved decision-making process and performance. This therefore demands for a comprehensive approach for measuring the organisational performance particularly in information study context.

Therefore, based on the above justification, the study problem statement discloses that:

Problem Statement 1:

There is a need to utilise a non-financial measure of performance in particularly when information systems are the predictor.

Second, due to the challenges and fierce competition, there is an increasing necessity to adopt information system that can assist the organisation to make better decisions such as predict customer demand and monitor competitor performance. Thus, banks strive to adopt diverse forms of business intelligence to curtail the challenges they face. Business intelligence is a term that describes the technology, application, and process of gathering, storing, accessing, and analysing data to help users make better decisions, assists organisations to make better management decisions and improving performance (Wixom & Watson, 2010; Chen et al., 2012). Some of the areas business intelligence covers in the bank include: Customer Relationship Management (CRM), Performance Management (PM), Risk Management (RM), Asset and Liability Management (ALM), and Compliance. Online analytical processing (OLAP) and data warehouse are used for the informational basis for the application of business intelligence in the banks, whilst data mining and knowledge retrieval handles complex statistical analysis, discovering hidden relationships between data and forecasting the behaviour trends of business systems (Ubiparipović & Đurković, 2011; Owusu, 2017).

In addition, business intelligence can improve decision making and enhance an organisation's performance to effectively react to the business environment pressures and even take advantage of opportunities to excel, because one of the primary objectives of business intelligence is to shut the gap of alignments to strategically achieve an organisation's mission, aims, and goals (Turban, Sharda, Aronson, & King, 2008). Studies showed that companies investing in business intelligence and trustworthy practices, managed to increase revenues and save costs even though there were also instances where companies did not manage to get any profit (Gessner & Volonino, 2005; Lonnqvist & Pirttimaki, 2006; Watson, Goodhue, & Wixom, 2002; Chen, et al., 2012). In addition, the advancement of business intelligence has revolutionized the business intelligence to support the dynamic business environment and enterprise agility (Bani, 2011; Zhao, Tanniru, & Zhang, 2007).

However, although business intelligence is often related to performance, existing research rarely explores this integration (Vuksˇic´, Bach, & Popovicˇ, 2013). In addition, there are inadequate empirical studies on why organisations must have business intelligence and how other internal resources communicate with business intelligence to generate high profit or perform in financial performance (Jourdan, Rainer, & Marshall, 2008; Sasvar, 2015; Watson, 2009; Işık, 2010; Wixom & Watson, 2010). In particular, the literature lacks research on business intelligence and performance within a management framework (Trkman, McCormack, Oliveira, & Ladeira, 2010; Sˇkrinjar, Bosilj Vuksˇic´, & Indihar Sˇtemberger, 2010; Vuksˇic´ et al., 2013).

In addition, this study was motivated by the fact that there are limited empirical evidence in the information systems literature when it comes to business intelligence systems adoption impact on organisational performance as many of the studies focused on business intelligence application development (Aruldoss, Lakshmi Travis, & Venkatesan, 2014; Owusu, 2017). In the context of developing countries, business intelligence systems are still in its early stages. Therefore, this study aims to assess the impact of business intelligence systems adoption on the bank's performance. Examining such impact empirically will help contribute to enrich the information study and strategic management literatures, especially from a developing country perspective. The empirical evidence resulting from this study can also help in the diffusion of business intelligence systems in organisations as vendors could capitalise on the findings to promote their products (Owusu, 2017). Such research is important, as it enables us to better understand the effect of business intelligence systems adoption on performance.

Therefore, based on the above justification, the study problem statement discloses that:

Problem Statement 2:

There is lack of study on the impact of business intelligence systems adoption on performance.

Third, information technology has become the essential infrastructure of any organisation, and the enabler of the business process (Bani, 2011; Gallo, 2010; Pantazi & Georgopoulos, 2006; Silvius, de Waal, & Smit, 2009). Byrd and Davidson (2006) concluded that information technology increases organisational performance and productivity. The study in information technology has a positive impact on organisational performance (Osei-Bryson & Ko, 2004) has been a long-standing debate in the information study literature and has received considerable attention from both academics and practitioners (Davern &

Kauffman, 2000; Irani & Love, 2000; Remenyi, Money, Sherwood-Smith, Twite, & Irani, 2000; Owusu, 2017).

However, there have been several controversies surrounding performance effects of information technology in spite of some encouraging evidence from some payoffs from information technology (Brynjolfsson, 1993; Brynjolfsson & Hitt, 1995, 1996; Hitt & Brynjolfsson, 1996). Whilst researchers (Brynjolfsson & Hitt, 1996; Kohli & Devaraj, 2003; Stratopoulos & Dehning, 2000) got a positive response from information technology impact on organisational performance, others (Brynjolfsson, 1993; Strassmann, 1990; Weill, 1992) had results ranging from non-significant, to even a negative relationship. However, most of these studies focused on the financial measures in which the investments in the information technology do not necessarily commensurate with the financial returns Hou (2015). It is evident in previous literature has largely overlooked the effects of information technology on organisational performance (Devaraj & Kholi, 2003; Karanja, 2011).

Therefore, based on the above justification, the study problem statement discloses that:

Problem Statement 3:

There is lack of study on the impact of information technology infrastructure on the non-financial measure of performance.

Fourth, business intelligence is key in today's unstable global environment because it leads to the creation of ideas and innovation (Mohsin, Halim, & Ahmad, 2015). In the western hemisphere and East Asia, business intelligence is being heavily utilised by large and smaller organisations (Tej Adidam, Banerjee, & Shukla, 2012; Priporas, Gastoris, & Zacharis, 2005) as a source of innovativeness and competitive advantage (Smith & Kossou, 2008; Wright, Bisson, & Duffy, 2012). A review of the literature shows business intelligence leads to the creation of innovativeness in the organisation (e.g., Hussein, Rezaie Dollatabady, Farzaneh, Ghandehari, & Amiri, Farham, 2011; Mohsin et al., 2015; Tanev & Bailetti, 2008). In addition, several information system researchers believed information technology is a critical component in developing innovation (Corso & Paolucci, 2001; Dewett & Jones, 2001; Xu, Teo, & Tan, 2005). Research suggested innovation using technology are significant with performance (Fabricio, 2004; Gary, Gaukler, & Hausman, 2008; Kumar, Oadri, Kumar, & Halem, 2013; Kuswantoro, Rosli, & Kader, 2012; Nada, 2008; Morgado, 2008; Gunnar, 2009; Wang, Chen, & Chen, 2012). Furthermore, innovation is known as a decisive ingredient for companies to create value and sustain competitive advantage and performance in today's extremely complex and dynamic environment (Ranjit, 2004). Some studies have found innovation is closely associated with organisational performance (Ansir, 2011; Pla-Barber & Alegre, 2007; Moini, 1995, Love, 2001, & Gunday, Ulusov, Kilic, & Alpkan, 2011). Based on the above justification, the relationship between business intelligence systems and information technology infrastructure and performance can also be understood indirectly through innovation.

Problem Statement 4:

Innovation has a mediation role in the relationship between business intelligence systems and performance, and information technology infrastructure and performance.

Fifth, innovation is believed to be the primary driver for organisations to increase performance. Turulja and Bajgoric (2018) argued that firms with higher levels of innovativeness and risk taking performed better in environments with higher levels of turbulence. Hence, this study included the competitive environment as a moderating variable since it is well suited to today's highly competitive, unstable and dynamic business environment. Past studies have reported miscellaneous empirical evidences on innovations and performance. For instance, that market turbulence (measurement of environment) did not moderate the relationship between innovativeness and business performance (Hult, Hurley, & Knight, 2004). While other study reported environmental turbulence moderated the relationship among innovativeness, risk taking, and firm performance Kraus, Rigtering, Hughes & Hosman. (2012). As the financial industry is facing rapid changes and operate in highly competitive environments, it is important the understand the effect of moderating variables in the relationship between innovation and performance. This is also supported by the contingency theory that greater firm performance or effectiveness can be achieved in more than one way, provided that the selection of the variables must be suitable (Ambad & Wahab, 2013). Thus, the competitive environment is included as it is unexpected, and a firm has no control on it.

Therefore, based on the above explanation, the study problem statement discloses that:

Problem Statement 5:

There is a need to understand the moderating effect of competitive environment in the relationship between innovation and performance.

Overall, to mitigate these gaps, the independent variables of this study consist of two major dimensions of business intelligence systems adoption and information technology infrastructure. The mediating effect of the mediator variable is innovation and the dependent variable is performance of the organisation. This research also studies the moderating effect competitive environment in the relationship between innovation and performance.

1.3 Research Questions

The problem statement guides in the formulation of the following research questions. This study answers to the following questions:

a. Does business intelligence systems adoption influence performance?

b. Does information technology infrastructure influence performance?

c. Does innovation mediate the relationship between business intelligence systems adoption and performance?

d. Does innovation mediate the relationship information technology infrastructure and performance?

e. Does competitive environment moderate the relationship between innovation and performance?

1.4 Research Objectives

The study examines the relationships among business intelligence systems adoption, information technology infrastructure, and performance. Specifically, the research objectives examine the mediation of innovation and moderation of competitive environment effect of several selected variables. The research objectives are:

a. To examine the relationship between business intelligence systems adoption and performance.

b. To examine the relationship between information technology infrastructure and performance.

c. To examine the mediation effect of innovation on business intelligence systems adoption and performance.

d. To examine the mediation effect of innovation on information technology infrastructure and performance.

e. To examine the moderating effect of competitive environment on the relationship between innovation and performance.

1.5 Definitions of the Key Terms

This study was focused on the following key terms that were frequently used in this research and they are listed as follows:

a. Performance

The firm performance's indicators are demonstrated from the aspects of the firm's growth and profitability.

b. Business intelligence systems adoption

Business intelligence systems adoption is a wide category of application, technology, and process for gathering, storing, accessing, and analysing data to assist business users in improving performance.

c. Information technology infrastructure

Information technology infrastructure is the technology architecture formulation to deliver actual competitive benefits for businesses.

d. Innovation

The development of new products and services in order to achieve performance.

e. Competitive environment

The level of the unpredictability and highly varied events which occur in the environment in which an industry operates.

1.6 Organisation of the Thesis

This thesis is presented in six chapters. Chapter One introduced the background of the study, problem statement, research questions, research objectives, significance of the study, scope of the study, definitions of the terms, organisation of the thesis, and chapter summary.

Chapter Two presents a comprehensive literature review of the relevant academic literature supporting the conceptual framework. These literatures are reviewed to position this dissertation in the on-going program of research on adaptation. This chapter reviewed the available related literature on the various variables in this study and provided an overall glimpse of the work done in related areas of the previous research. The literatures were grouped into separate sections that associated with business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance.

Chapter Three, the hypotheses development presents the relevant theories explained based on studies. This chapter outlined the relevant underpinning theories; knowledge-based theory, resource-based theory, and contingency theory. This chapter also provides the hypotheses derived from the research framework. These hypotheses guide the empirical part of the study. Hence, the hypotheses and conceptual framework give the reasons why the framework is chosen for the study. The conceptual framework was developed after an extensive search of literatures.

Chapter Four describes the research methods employing empirical procedures. An overview of the research design, a description of population and sampling procedures, and an outline of the measurement and instrumentation for each of the constructs are included in this chapter. The reliability and validity safeguards employed, and data analysis procedures and pilot-test are discussed.

Chapter Five presents the findings derived from the study. Descriptive data on the sample are reviewed and then, the research questions and working hypotheses are answered. The chapter then concludes with a tabular review of the key findings.

Chapter Six provides a discussion of these results, summarizes the contributions of the study, highlights the implications for academics and practitioners, and outlines its limitations. Finally, directions for further research conclude the dissertation.

1.7 Chapter Summary

This chapter laid the foundations for this study. The first part of this chapter is the introduction and background of the study, followed by the statement of the problem. Next, the research questions and research objectives were presented. Lastly, the definition of key terms and organisation of the thesis was briefly described as a guideline. In the following chapter reviews the literature on the relevant topics, concepts and issues with regards to business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter explores the extent literature to explain the relationship between the variables of interest. This chapter also provides the general overview of the research variables. This study reviews the literature on all variables, namely performance, business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment in establishing the theoretical foundation for the study.

2.1 Performance

In the 1950s, Georgopoulos and Tannenbaum (1957), defined organisational performance as the extent to which organisations, viewed as a social system fulfilled their objectives and evaluated performance based on work, people and organisational structure. It was defined in the late 60s and 70s as an organisation's ability to exploit its environment for accessing and using the limited resources (Yuchtman & Seashore, 1967). In the 80s and 90s, performance was an organisation accomplishing its goals (effectiveness) using a minimum of resources (efficiency). This led to profit becoming one of the many indicators of performance (Campbell, 1977; Gavrea et al., 2011; Lusthaus & Adrien, 1998). However, Lebas and Euske (2006) outlined a set of definitions to explain the concept of organisational performance. The main definition includes performance measured as a set of financial and nonfinancial indicators which offer information on the degree of achievement of objectives and results (Owusu, 2017).

Consistency in the definition and operationalisation of business performance has eluded researchers for a long time (Kirby, 2005). The number of researches regarding this topic has since expanded, subsequent trimming down the possibility of achieving a general agreement in defining the basic terminology (Richard, Devinney, George, Yip, & Johnson, 2009). Despite the various definitions and terminologies of organisational performance, there is an agreed consensus among researchers which states that business performance is dependent on the strategies and operations in the market and non-market environments (Orlitzky, Schmidt, & Rynes, 2003). As an example, in researching the effects of information technology and diversification on the performance of a business, Chari, Devaraj, and David (2008) defined firm performance in terms of Tobin's Q ratio, which can be measured as the market value divided by the value of total assets. Other researchers who have adopted the Tobin's Q method in evaluating business performance include Chung and Pruitt (1994), Bharadwaj, Bharadwaj, and Konsynski (1999), Montgomery (1994), Richard, Murthi, and Ismail (2007), Tanriverdi and Venkatraman (2005), and, Wiggins and Ruefli (2005). Others define performance as the results of the operations, performed by the members of the organisation (Ofoegbu, & Akanbi, 2012; Ruey-CGwo & Chieh Ling, 2007).

Conventionally in the study of strategy, the ultimate dependent variable is the performance of the firm. Performance, which describes the perspective of strategic management, is a subdivision of a broader concept of organisational effectiveness (Venkaratmen & Ramanujam, 1986). The significance of congruence or fit between the diverse elements of corporate entrepreneurship has been identified by many researchers and recorded in the explanation and prediction of firm performance (Galbraith, 1977; Nadler & Tushman, 1997; Tosi & Locum, 1984). Various factors have been considered and are believed to affect the performance of a firm. These factors can stem from the firm itself, either internally or externally (Kotey & Meredith, 1997; Pearce & Robinson, 2002).

According to Demirbag, Tatoglu, Tekinus, and Zaim (2006), and Al-Swidi, and Al-Hosam, (2012), the conventional method in measuring organisational performance is by applying the cost-based and account-based methods. Some studies ventured on the non-financial measures due to several justifications, whilst the majority used the account-based measurement method to measure organisational performance. The justifications made to employ non-financial method is because the financial measures are unstable and may be too responsive towards any changes in industry-related factors. Next, the reflection of the real performance might be jeopardised as the financial measures can be manipulated easily. The conflicts in providing the best criterion to define organisational performance have created continuous debate among different advocates (Jusoh, Ibrahim, & Zainuddin, 2008).

Antony and Bhattacharyya (2010) provided construct conceptualisations in which organisational performance was described as the measure of success of an organisation concerning to the value it creates and distributes to all customers, both internal and external. The performance of an organisation is reflected in the actual organisational output when compared with the intended organisational outputs, goals, or objectives. There are not many consistent measures and definitions for the performance of an organisation (Karanja, 2011; Kirby, 2005; March & Sutton, 1997). It is rather surprising to comprehend given its significance in assessing the effectiveness of the strategies and the firm's competitiveness. In studying organisational performance, many researchers have considered three primary elements as the foundation for their definitions and therefore conceptualisations. The elements are market orientation, financial or accounting strategies, and customer satisfaction or social responsibility ends.

Measures that correlate with financial or accounting performance include profitability ratios (return on sales, return on assets, return on equity, and return on investment), labour productivity, and sales growth. Kobelsky, Richardson, Smith, and Zmud (2008) looked into the causes and effects of information technology investments made by a firm and implemented return on sales (ROS), which can be defined as the ratio of net operating profit over sales made by the firm in every study period, as a performance standard. Return on sales is a standard and a common performance measure in the information technology sector and the related areas (Bharadwaj, 2000; Bhatt & Grover, 2005; Byrd & Marshall, 1997; Dehning & Stratopoulos, 2002; Kettinger, Grover, Guha, & Segars, 1994; Morrow, Sirmon, Hitt, & Holcomb, 2007; Tam, 1998). On the other hand, Ravichandran, Liu, and Hasan (2009) researched the mediating effect of investments made by a firm in the information sector and its diversification strategy as well as performance and used return on assets (ROA) as a performance measure.

Return on assets can be defined as the financial ratio of net operating income to the firm's start-of-year assets as reflected in the firm's accounts like the balance sheet. Return on assets is a favoured accounting measure of efficiency and is also extensively used in information technology literature (Bharadwaj, 2000; Bhatt & Grover, 2005; Barua, Kriebel, & Mukhopadhyay, 1995; Dehning & Stratopoulos, 2002; Wooldridge & Floyd, 1990; Pehrsson, 2006; Rao, Chaudhury, & Chakka, 1995; Short, Ketchen, Palmer, & Hult, 2007; Tam, 1998). Researchers have also made the case for the use of market or value-based measures and have argued that these measures are better indicators of firm performance as compared to the financial or accounting measurement methods. The most favoured measures in this category are earnings per share, stock market returns, and Tobin's Q ratio.

A firm performance, and thus competitive advantage, is driven by the activities or routines carried within the firm or with the external stakeholders (Ray, Barney, & Muhanna, 2004). This economic belief applies the value chain methodology in comprehending how carried out by the firm affect the competitive positioning of the organisation of the firm (Porter, 1985). The evolutionary economic theories of firm behaviour evaluate the correlation between superior firm performance and firm routines (Nelson & Winter, 1982; Karanja, 2011). The activities and routines perspectives were based on the premise that firms succeed did.

However, critics have argued that these measures are still financially oriented and assumed that the firm's strategies are oriented towards financial goals and dominated by this goal (Venkatraman & Ramanujam, 1986). Thus, to broaden the conceptualisation of business performance, adopted indicators of operating performance or effectiveness in isolation or in addition, on top of the financial performance measures. These measures include (i) market share, (ii) introduction of new products, (iii) quality of products, (iv) effectiveness of marketing strategies, (v) value-added from manufacturing, (vi) technological efficiency, (vii) information technology, (viii) employees' skills, and (ix) business alignment.

While many studies measured performance in terms of financial indicators, there are studies that used other indicators such as productivity, efficiency, stock market indices or other similar data. For example, Chintrakarn (2008) has used multiple regression analysis to show that increased stringency in environmental regulations has led to greater technical efficiency (computed using stochastic a frontier model) in Unites State manufacturing industries. Murty and Kumar (2003) have studied the impact of environmental regulation on the performance of firms in the Indian sugar industry measured the performance of firms using data employment analysis efficiency scores. Thus, data employment analysis efficiency of firms increased with the degree of compliance of firms to the environmental regulation. Gray and Shadbegian (2003) have used productivity to measure performance, but find negative relationships (Ramanathan, Black, Nath, & Muyldermans, 2010).

Measures associated with financial or accounting performance include sales growth, profitability ratios (return on sales, return on assets, return on investment, return on equity, etc.), and labour productivity among others. Kobelsky et al., (2008) investigated the determinants and consequences of information technology at the firm level and utilized Return on Sales (ROS) as a performance measure.

The performance of an organisation is reflected in the actual organisational output when compared with the intended organisational outputs, goals, or objectives. There are few consistent definitions and measures of organisations' performance, which is surprising given its importance in evaluating the effectiveness of firms' strategies and competitiveness (Kirby, 2005; March & Sutton, 1997; Karanja, 2011).

2.2 Business Intelligence

The term business intelligence was introduced by Gartner Group in the mid-1990s. Nevertheless, this term has become very popular and it has its roots in the management information reporting systems of 1970s. In that era, static reporting systems were two-dimensional and did not possess the analytical capability. In the early 1980s, the concept of executive information systems (EIS) came into existence. This concept introduced computerized supporting systems to high-level managers and executive board. These systems had the capabilities of dynamic and multi-dimensional reporting (ad hoc or desire based), forecasting, trend analysis, analysing the details and access to the key elements of successfulness. Until the mid-1990s, many commercial products used to have these features. Then some new products have been established in the name of business intelligence. All the information needs executives can be compiled in the form of an information system based on business intelligence (Raisinghani et al., 2004; Gartner, 2007; Aghaei & Asadollahi, 2013).

There are many different definitions of business intelligence that have been recorded in both academics and practitioner literature. While some define business intelligence as a complete mechanism to support decision-making process in an organisation (Alter, 2004; Moss & Atre, 2003; Işık, 2010), others perceive business intelligence more technically (Burton & Hostmann, 2005; White, 2004). Table 2.1 shows some of the more extensive definitions of business intelligence.

Table 2.1:
Selected Business Intelligence Definitions

Business Intelligence Definitions	Author
A system where data are acquired and translated into actionable information.	Eckerson (2003)
It is the architecture and a set of integrated processes and decision support applications that provides the possibility of access to business data for business communities.	Moss & Atre (2003)
Reports generated through a series of processes namely collecting, analysing, assessing, and implementing business information.	Chung et al., (2004)

A general term that comprises data warehousing (DW), analytical processing, reporting, predictive analytics, and performance management.	White (2004)
A mechanism in which data are analysed using certain process that can help organisations to gain better efficiency and revenue through enhanced decisions and business practices.	Burton and Hostmann (2005)
Business intelligence is a system that is used for utilization of the results of collection, analysis, evaluation and utilization of information in the business realm.	Chang, Hussain, & Dillon (2006)
It is a system for supporting the decisions that include tools for data storage, intelligent reporting, online analytical processing, data mining, performance management, predictive analysis and etc.	Wise, L. (2007)
Business intelligence is a combination of products, technologies and methods to organize the key information which is used for continuous improvement of profit and performance management of organisations.	Williams & Williams (2007)
It is a set of concepts, methods and processes aimed at improving business decisions and supporting the organisation's strategy.	Olszak & ziemba (2003)
Integrated elements such as products, methods, and technology to analyses major information for management to improve its revenue and performance.	Williams and Williams (2007)
Business intelligence is a tool which is used in order to develop useful information to help organisations in the global economy and to predict the general business environment.	Jourdan et al., (2008)
Both products and processes that are used to establish useable information. This is to assist organisation's survival in the global economic realms and to forecast the trend of the business environment.	Jourdan et al., (2008)

Source: Aghaei & Asadollahi, 2013; Işık, 2010

The business intelligence terminology has been disconcerting. There are different interpretations of business intelligence and many terms applied to it (e.g. competitive intelligence, market intelligence, customer intelligence, competitor intelligence and strategic intelligence). The use of these terms is haphazard both in academia and the business world. After all, almost all the definitions share the same referent, even if the term has been defined from several perspectives and they all include the idea of analysis of data and information. The main idea in business intelligence is to aid in controlling the vast stocks and flow of business information around then processing the information into condensed and useful managerial knowledge and intelligence (Casado, 2004; Shubiri, 2012).

Watson (2009) described business intelligence as a broad category of applications, technologies, and processes for gathering, storing, accessing, and analysing data to help business users make better decisions. In basics, business intelligence can be further defined as a collection of systems and procedures that translated raw data into actionable information to assist managers in making better business decisions (Wixom & Watson, 2010). According to Laursen & Thorlund (2010); Chen et al., (2012); at the implementation level, business intelligence consists of three elements. First, the technologies that gather, store, and convey information. This includes the common technology of business intelligence that carries out basic functions to support unspecified actions such as collecting, saving, accessing, and analysing data. Second, the user's competencies element which can be described as how efficient the users are to extract the data and subsequently conveying them as usable information. This information must be able to produce knowledge so that it can be used as a basis of making tactical business decision. In business intelligence, basic functions are provided; however, it will still depend on the users to be able to produce the best decisions out of business information system. To achieve this, the human operator must have a certain level of competency in retrieving and generating reports to support the decision-making process. The third element comprises of special functions of business intelligence. For instance, a business intelligence system is created to provide the business related information and the goal is to assist users in setting up automatic responses should certain conditions reached the pre-set level. This element is one of the advanced features of a business intelligence system. Hence, it transforms business intelligence system to be more than just a reporting application but also, to an extent, as a system that can be used to automatically control the business (Laursen & Thorlund, 2010).

Business intelligence is a general concept which includes architectures, tools, databases, applications and methodologies (Raisinghani et al., 2004: Aghaei & Asadollahi, 2013). The main objective of business intelligence is to make the interactive availability of data and data management possible and provides the possibility for analysts and business managers to carry out their required analyses. Decision-makers, with analysis of current and historical data, positions and functions, gain a good perspective and they can make better decisions based on this information (Zaman, 2005). Business Intelligence is based on converting data to information and then making decision and finally taking action.

Business intelligence has increasingly become the top priority for many firms and organisations. Furthermore, the prospect of business intelligence is drawing in many others at a rapid pace (Evelson, McNabb, Karel, & Barnett, 2007; Işık, 2010; Işik, Jones, & Sidorova, 2013). Reports from users' survey in Gartner Group's business intelligence in 2008 suggested that business intelligence was the dominant priority for many chief information officers (CIOs), (Sommer, 2008). With the need for the organisations to collect massive amounts of data from various resources, the implementation of business intelligence to perform the task, including organising and analysing the data is a value-added to the organisation. Business intelligence can also provide business users with instantaneous data (real-time), allowing them to come out with better decision and providing them a competitive edge against their competitors by being ahead in the game (Gile et al., 2006). Despite the high reputation of business intelligence in many organisations, research proved that inconsistencies still exist in business intelligence's overall success.

Business intelligence system is a system providing quality information that is equipped with business-friendly software tools and well-designed data stores (Olszak & Ziemba, 2003, 2012). The application of such system ensures that the knowledge workers have timely access to information, can perform effective analysis, and can get an intuitive presentation of the right information. The adoption of business intelligence systems to provide support for the achievement of a firm's strategic business goals, business process reengineering, provision of higher quality of information and eventually better support for decision-making (Watson, Wixom, Hoffer, Anderson-Lehman, & Reynolds, 2006) has made it a very popular technology recently for both researchers and practitioners (Olszak & Ziemba, 2003, 2012). Various components of business intelligence systems are used by employees in various positions to access the firm's data, work with the data and analyse it for managing the operations of the firm. This helps to improve the firm's operations efficiencies. Business intelligence can also assist a firm to discover new opportunities and also help in engineering their operational activities (Howson, 2007). As a result, the literature points out that a lot of organisations have implemented business intelligence systems using maturity models and critical success factors (CSFs), (Dawson & Van Belle, 2013; Fedouaki, Okar, & Alami, 2013; Hribar Rajterič, 2010; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010; Yeoh, Koronios, & Gao, 2008). As business intelligence is still evolving and new tools are always emerging, many organisations keep upgrading and spending heavily to improve their systems. Gartner (2017) emphasised that most of this spending will result from modern business intelligence and analytics platforms which continue to grow more rapidly than the overall market, and thus balancing the drop in traditional business intelligence spending. Generally, the modern business intelligence and analytics platform were developed recently in order to meet new organisational requirements for accessibility, agility and deeper analytical insight, shifting the market from information technology-led, system-of-record reporting to business-led, agile analytics including self-service (Gartner, 2017; Owusu, 2017).

Business intelligence systems are systems that comprises a broad category of technologies, applications, and processes which are used for gathering, storing, accessing, and analysing data into actionable information to help business users take informed decisions in order to improve business performance (Azvine, Cui, Nauck, & Majeed, 2006, Watson, 2009). Business intelligence systems are reported widely in the literature as providing a lot of benefits to organisations. Thompson (2004) lists the following benefits business intelligence bring to companies from a survey results: (1) faster and more accurate reporting; (2) an improved decision-making process; (3) improved customer satisfaction; (4) increased revenues; (5) savings in information technology; and (6) savings in other areas in addition to information technology.

Likewise, Ritacco and Carver (2007), for instance, divided business intelligence benefits into four groups: (1) lowering costs through improved operational efficiency, eliminating report backlog and delays, negotiating better contracts with suppliers and customers, finding root causes of problems and taking action and identifying wasted resources and reducing inventory costs; (2) increasing revenue through selling of information to customers, partners and suppliers, improving strategies with better marketing analysis and empowering your sales force; (3) improving customer satisfaction through giving users the means to make better decisions, providing quick answers to user questions and challenging assumptions with factual information; and (4) improving communication within the company. In addition, Moss and Atre (2003) categorised the benefits of business intelligence as: (1) an increase in revenue; (2) an increase in profit; (3) improved customer satisfaction; (4) a reduction of costs; and (5) an increase in market share. It has also been declared that these benefits are giving the organisations competitive advantage (Davenport, 2006; Matei, 2010; Negash, 2004; Owusu, 2017).

Business intelligence systems present complex corporate and competitive information to planners and decision makers. The objective is to improve the timeliness and quality of the input to the decision process. Business intelligence is a form of knowledge. The techniques used in knowledge management for generating and transferring and application of knowledge (Davenport & Prusak, 1998, Shubiri, 2012). Some knowledge is bought (e.g., scanner data in the food industry) while other knowledge is created by analysis of internal and public data. Knowledge transfer often involves disseminating intelligence information to many people in the firm.

The independent variable of this study is business intelligence systems adoption. Adoption is defined as the acceptance and the continued use of an innovation (Robertson, 1971; Rice & Rogers; 1980, Owusu, 2017). In addition, Rogers (1962, 1995) sees adoption as a decision to continue full-scale use of an innovation. Therefore, business intelligence systems adoption, in this study, refers to the bank's adoption, implementation and use of business intelligence systems in their operations based on Rogers definition.

2.3 Information Technology

Information technology infrastructure as the extent to which applications and data are able to be shared by means of communication networks and retrieved for the use of the organisation (Jorfi, Nor, & Najjar, 2011). Information technology infrastructure defined as a set of shared information technology resources which is related to communication across the organisation (Chanopas, Krainit, & Khang; 2006). The two main components of information technology infrastructure are technical and human infrastructures. According to Chanopas et al., (2006) information technology infrastructure is the ability of existing information technology to adapt to change from both within and outside the organisation to facilitate information sharing, system development and continuity of information technology operations with minimal effort and time (Byrd & Turner, 2000; Chen, Sun, Helms, & Jih, 2009).

Information technology infrastructure is consistently defined in literature as a set of shared information technology resources that are a foundation for enabling communication across an organisation and enabling present and future business applications (Byrd & Turner 2001; Chen & Siau, 2012; Duncan 1995; & Niederman, Brancheau, & Wetherbe, 1991). It not only includes the technological components, but also the human components (Chanopas et al., 2006; & Duncan 1995). The definition of information technology infrastructure by emphasizes information technology infrastructure's ability to easily and readily support a wide variety of hardware, software, and communication technologies, to distribute information to anywhere inside an organisation and beyond, and to support the design, development, and implementation of a heterogeneity of business applications (Byrd, 2001; Byrd & Turner, 2001; & Chen & Siau, 2012).

The definition of information technology infrastructure encompasses a variety of components. Based on previous studies, Duncan (1995) stated that information technology infrastructure includes a group of shared, tangible information technology resources that provide a foundation to enable present and future business applications (Broadbent &

Weill, 1997; Davenport & Linder, 1994; Earl, 1989; Keen, 1991; McKay & Brockway, 1989; Niederman et al., 1991; Weill, 1992). These resources include computer hardware and software (e.g., operating systems), network and telecommunications technologies, key data, core data-processing applications, and shared information technology services (Chung, Rainer, & Lewis, 2003).

Byrd and Turner (2000) defined information technology infrastructure as the ability to easily and readily diffuse or support a wide variety of hardware, software, communications technologies, data, core applications, skills and competencies, commitments, and values within the technical physical base and the human component of the existing information technology infrastructure. Historically, the information technology infrastructure has been viewed as necessary to accommodate a rapidly changing business environment (Byrd & Turner, 2001).

Byrd and Turner (2000) provided a thorough definition of information technology infrastructure as the shared information technology resources consisting of a technical physical base of hardware, software, communications technologies, data, and core applications and a human component of skills, expertise, competencies, commitments, values, norms, and knowledge that combine to create information technology services that are typically unique to an organisation. These information technology services provide a foundation for communications interchange across the entire organisation and for the development and implementation of present and future business applications. McKay and

Brockway (1989) described information technology infrastructure as the enabling foundation of shared information technology capabilities upon which the entire business depends. This foundation is standardized and shared by business functions within the organisation, and typically used by different organisational applications.

Duncan (1995) also stated that information technology infrastructure includes the alignment of information technology plans with business objectives, the information technology architecture, and the skills of information technology personnel. Noted that information technology infrastructure enables the various types of information technology applications required to support current and future business objectives and enable the competitive positioning of business initiatives (Broadbent and Weill (1997; Chung et al., 2003).

As can be seen from these definitions, the information technology infrastructure is composed of two components: a technical information technology infrastructure and a human information technology infrastructure. The technical infrastructure consists of the applications, data, and technology (Broadbent & Weill, 1997; Broadbent, Weill, O'Brien & Neo, 1996; Henderson & Venkatraman, 1999). The human information technology infrastructure consists of the knowledge and capabilities required to manage organisational information technology resources (Broadbent & Weill, 1997; Lee, Trauth & Farwell, 1995). Davenport and Linder (1994) suggested that a robust information technology infrastructure enables employees to be able to perform their respective jobs, both from having the available technology and the necessary technological skills.

The information technology infrastructure is a shared information delivery base, the business functionality of which has been defined in terms of its reach and range (Keen 1991). While the reach determines the locations that the platform can access and to which it can link, its range defines the kind of information that can be seamlessly and automatically shared across systems and services. A firm's information technology infrastructure has been described as a major business resource and a key source for attaining long-term competitive advantage (Keen, 1991; McKenney, Mason, & Copeland, 1995). The infrastructure underpins a firm's competitive position by enabling initiatives such as cycle time improvement, cross functional processes, and cross-selling opportunities (Sambamurthy & Zmud 1992; Weill & Broadbent 1998). As Keen (1991) notes, the information technology platform that determines the business degrees of freedom a firm enjoys in its business plans. A non-integrated information technology infrastructure dominated by system incompatibilities severely restricts an organisation's business choice. Creating an integrated information technology infrastructure, however, requires both considerable time and expertise. As firms develop information technology infrastructures that span entire organisations, linking key suppliers and customers, they evolve elaborate rules regarding the distribution and management of hardware, soft- ware, and other support services (Bharadwaj, 2000; Ross, Beath, & Goodhue, 1996).

The information technology infrastructure is a shared information delivery base, the business functionality of which has been defined in terms of its reach and range (Keen 1991). Therefore, information technology is the ability to accommodate changes in information technology infrastructure and business. An organisation, that has established an information technology infrastructure should be adaptable to changes and satisfy the stakeholders' needs and wants more efficiently and effectively (Chen et al., 2009; Newman et al., 2014).

Information technology infrastructure can be associated with the level of malleability of the firm's information technology resources (Duncan, 1995). Byrd and Turner (2001) defined information technology infrastructure's as a capability to readily support a vast mixture of software, hardware, and communication technologies with less hassle; to provide information across the whole organisation and beyond; and to back up the design, evolution, and execution of a diverseness of business applications. The four key elements of an information technology infrastructure are compatibility, connectivity, modularity, and information technology personnel's competency in using the information technology system. Chanopas et al., (2006) widened the spectrum of the components of information technology infrastructure. Byrd and Turner (2000) added these components, which involve scalability, modernity, rapidity, continuity and facility, that enable rapid response to the dynamic business environment. Four key components of information technology infrastructure have been identified in the literature (Chen & Siau, 2012). Connectivity, compatibility, modularity, and information technology personnel competency were first identified by Duncan (1995) and Byrd and Turner (2001). Mishra and Agarwal (2010) added organisational cognition of information technology technologies (technological frame) as another component of information technology infrastructure. However, most commonly accepted dimensions of information technology infrastructure are connectivity, compatibility, and modularity and become this study reviews.

2.3.1 Connectivity

Information technology infrastructure, according to Mensah (1989), is the ability to respond and adapt to changing business conditions both within and outside the organisation. Ness (2005) studied information technology infrastructure i.e. connectivity, compatibility, and modularity with relation to strategic alignment. Connectivity is the ability of any technology component to communicate with any of the other components inside and outside of the organisational environment (Chung et al., 2003; Duncan, 1995). Tapscott and Caston (1993) emphasized that information technology connectivity enables seamless and transparent organisations that are independent of time and space. Connectivity facilitates the shareability of information technology resources at the platform level.

The number of platforms that a business entity can hook up to be symbolized as connectivity (Duncan, 1995; Tallon & Kraemer, 2003). In the application of the term reach, connectivity, formerly emerges to have been resulting from the study by Keen (1991). It involves the number of locations to which the platforms or technology can link to or can be connected. This ideology was confirmed by Goldman, Nagel, and Preiss (1995), when suppleness was considered a way of competition and facilitation of the virtual organisation.

Additionally, connectivity was identified by E-sourcing (2002) as a means of delivering information technology on demand. Blodgett (2004) mentioned how Intelsat underwent a fundamental and brisk alteration to a for profit organisation offering network connectivity for enterprises globally. In order to assist with the coordination of the fierce construction demands, it required an incorporated systems infrastructure. In general, when a technological component is capable of coordinating and communicating with any other component within the establishment as well as with the external environment, this is defined as connectivity (Duncan, 1995). It has been stressed by Tapscott and Caston (1993) that with the information technology connectivity, organisations that are flawless and transparent are able to be free from the influence of time and space. It is much easier to share information technology resources at the platform level with connectivity.

Technological connectivity is the capability of information technology systems to communicate and carry out coordination among various elements of the organisation either at the internal level or the external. According to Chanopas et al., (2006) and Byrd and Turner (2000), connectivity is the capability of information technology elements of the organisation to connect and interact with others, internally and externally. The information technology elements include both hardware and software. The business world is experiencing globalisation; therefore, the connectivity goes beyond the intra organisation to include outside as well as external stakeholders regardless of location (Chanopas et al., 2006). Electronic connectivity (e-connect) can facilitate communication and coordination of data storage, order entry and management, decision support, reporting and decision making, which can contribute to improve information effectiveness and to increase business productivity (Bani, 2011).

Rouse (1999) stated computer and communications technologies are dramatically increasing in connectivity and providing rich opportunities for organisational creativity. Three main connectivity applications are currently widely used. The first type is hosted applications, where clients make requests of servers using a Web based application like Apache, Web logic application, or Java Connection. The second type is broadcast applications, where digital content is broadcasted from a data centre to multiple clients. The third type is peer-to-peer applications, where the network provider provides the connectivity between its customers (Bani, 2011; Newman et al., 2014; Siegel, 2002).

Gorlenko and Merrick (2003) recognise that the connected mobile world offers a vast array of possibilities beyond leisure communication. Mobile devices supported by wireless connectivity can dramatically change the ways in which people interact with computers. Tasks and functions that have been conventionally carried out undertaken in a fixed and pre-designated location or setting, such as an office, can be carried out at almost anywhere (Bani, 2011). Therefore, telecommuting and virtual offices are becoming widely used throughout private and public sectors. The Internet provides global connectivity and low-cost, high bandwidth global communications. According to Arthur (1996), this in turn creates major network economies and economies of scale and the desire to be connected 24/7 has been adopted by many organisations and public institutions.

According to Bray (2008), middleware is connectivity software that consists of a set of enabling services that allow multiple processes running on one or more machines to interact across a network. Middleware is what bridges the connectivity gap between the calling applications and the services (databases) that serve up the data. Middleware tools enable access to internal and external data and information from a variety of front-end applications. The distributed and mobile computing goal of anytime, anywhere connectivity may be extended to pervasive computing, which always makes technology available to fulfil business and education needs in all areas of advancing technology (Turban, Leidner, McLean & Wetherbe, 2008). Moreover, organisations are implementing technologies with adequate connectivity that would allow them to utilise and access information for a business strategy for a competitive edge and to meet a standard compliance.

2.3.2 Compatibility

Compatibility is the ability to share any type of information across any technology component throughout the organisation (Duncan, 1995; Keen, 1991). Information technology compatibility helps span organisational boundaries, empower employees, and make data, information, and knowledge readily available in the organisation (Tapscott & Caston, 1993; Chung et al., 2003). Technological compatibility refers to the alleged fit and consistency of the system (software and hardware) required for effective information sharing and communication with the organisation's existing information technology infrastructure (Kamal, 2006). According to Chanopas et al., (2006), and Byrd and Turner (2000), compatibility is the capability of the information technology system to share and distribute any information across various platforms of technology (hardware and software). As the organisation is increasingly interconnected and e-connected within and the outside organisation, it is no longer a technological island (Ness, 2005; Bani, 2011). Compatibility is the ability to integrate numerous enterprise systems (ES) and enable them to share information (Byrd, Pitts, Adrian & Davidson, 2008).

Incompatibility and importability of an information technology infrastructure can occur as a result of an increasing number of mergers and acquisitions of companies and integrating the information technology infrastructures of these companies can be challenging, especially if these companies have incompatible requirements for their enterprise systems, hardware, and operating systems (Emmerich, Aoyama & Sventek, 2007; Bani, 2011, Newman et al., 2014). An organisation's information technology infrastructure (hardware, software, and networking technologies) internal and external compatibility is often overlooked, causing information technology systems to fail (Singh, Lai & Cheng, 2007). Compatibility and portability are the concerns for Web database access in which an application must be compatible with many types of servers and browser platforms

(Mannino, 2007). Therefore, the incompatibility of information technology infrastructure (software, hardware, and networks) can negatively impact inter and intra-organisational information sharing and communication which can negatively affect the information technology effectiveness (ITE).

It can be argued that the information technology industry has established portability and compatibility guidelines, standardisations, and best practices to eliminate or minimise any issues with the data sharing ability across all platforms both inside and outside the organisation. Achieving higher degrees of standardisation and information technology compatibility can be used as an advantage and value-added to the business for the stakeholders (Scheel, 2005; Bani, 2011). Tallon (2008) concluded that there is a positive effect and added value when businesses adopt and deploy a compatible information technology infrastructure. Therefore, information technology infrastructure's compatibility with existing and future systems is strategically and operationally crucial.

2.3.3 Modularity

Modularity is the feasible decomposition of a complex programme or application into more discreet modules or components; and a component is self-contained and can be integrated to form the whole application (Ness, 2005). Modularity is an effective way to manage the complexity of enterprise system (Zhang, Li & Ziegelmayer, 2008). Such is achieved by dividing applications into smaller modules that can then communicate, interlink, integrate, and interact with each other. Modular programming or application makes it easier to accomplish large and complex tasks (Bani, 2011).

Modularity is the ability to easily reconfigure (add, modify, or remove) technology components (Duncan, 1995; Chung et al., 2003). It stated that modularity is the standardization of business processes for shareability and reusability (structured programming and component-based software architectures). Schilling (2000) suggested that modularity is a continuum describing the degree to which a system's components can be separated and recombined.

Modularity as the capacity of an information technology system to feasibly add, change, configure, and discard any module in an enterprise application with minimum interruption reconfiguration to support new business requirements; and the same may apply to data and hardware components of an information technology infrastructure (Byrd & Turner, 2000; Chanopas et al., (2006). Modularity is not limited to only enterprise module systems. The modularity of an information technology infrastructure may include software, data, and hardware components. Service oriented architecture (SOA) technologies can facilitate information technology modularity and information technology infrastructure's flexibility by addressing the strategic development of the organisation.

As argued by Seltzer (2005), the modularity is an impressive and reliable tool to handle the size and intricacy of an organisational system, at the same time allowing the application and data management abilities to interact smoothly. Byrd and Turner (2000) asserted that the modularity of information technology resources (software, data, hardware, and telecommunication) provides the favourable impact to the organisation's information technology effectiveness and the competitive advantage gained from information technology. Therefore, information technology modularity is a vital key to information technology-business value (Bani, 2011; Newman et al., 2014).

2.4 Innovation

Innovation is defined as the adoption of an idea or behaviour that is new to an organisation (Daft, 1978; Damanpour & Evan, 1984). The adoption of innovation is described as a process that includes generation, development and implementation of new ideas or behaviours. Innovation is not only an adoption, but also an adaptation of new information and practices which lead to the ability to create new ideas and apply them to improvise new products, services, processes and procedures (Bates & Khasawneh, 2005). The definition of innovation has evolved into different categories which include products, production methods and technologies, markets, services and organisational structure and an assumption is made that the source of information varies between different types of innovation (Freel & de Jong, 2009; Tödtling, Lehner, & Kaufmann, 2009). Innovation can either be radical which is revolutionary and original (Green, Gavin, & Aiman-Smith, 1995) or incremental which are small improvements on an established process, products or services. Innovation is practiced by all types of organisations regardless of size because it is proven that organisations that are innovative has higher profits and market share (Mohsin et al., 2015; Oke, Burke, & Myers, 2007; Prajogo, 2006).

Innovation is the process of understanding or creating knowledge and converts it into new or improved products and services, for people who want them. Innovation is the process of obtaining an idea from its creator and converts to products, services and new methods of operation. Innovation can create the talent and ability to change or adapt. Innovation is important because can provide better products and better services, introduce improved models for business and can provide more efficient production processes for business owners. The complexity of today's competition, innovation is as one of the main advantages of companies' life. All organisations need innovative ideas for survival. New and innovative ideas are like spirit in the body of organisations and it can save them. Appearance of innovation not only enables organisations to gain competitive advantage over competitors, but also provides useful tools for improving organisational performance (Hussein et al., 2011). Innovation plays a key role in defining the way in which a company competes and utilizes market opportunities to achieve competitive advantages (Ganter & Hecker, 2013; Gunday et al., 2011; Kim & Lui, 2015; Schumpeter, 1976)

There has been significant interest in product and firm innovativeness in recent years. An innovation is defined as an idea or object that is perceived as new by an individual or an agency (Rogers, 1995). The perceived newness of the idea from the individual's point of view determines his or her reaction to it. If the idea seems new to the individual, it is an innovation (Robertson & Yu, 2001; Erdil, Erdil & Keski, 2004). An innovation consists of certain technical knowledge about how the things can be done better than the existing state of the art (Tyler, 2001). The innovativeness of a new product and firm innovation capability is important for several reasons. Innovative products present opportunities for firms in terms of growth and expansion into new areas as well as allow firms to gain competitive advantage. Innovation by itself is defined as the generation, acceptance, and implementation of new ideas, processes, products or services. The innovation process includes the acquisition, dissemination and use of new knowledge (Calantone, Cavusgil, & Zhao, 2002), and successful implementation of creative ideas within an organisation (Amabile, Conti, Coon, Lazenby, & Herron, 1996).

Significant innovations allow firms to establish dominant competitive positions and afford newcomer firms an opportunity to gain an edge in the market. Innovations are also associated with high risks and may require more firm resources. Firm innovativeness consists of different dimensions; product innovativeness examined in the literature, both from the customers' perspective and the firm's perspective; innovation in production processes (Victor, Boynton, & Stephens, 2000), work organisation, and human resource management practices (Baer and Frese, 2003). A product or a process orientation of firm innovativeness will result in success if the firm undertakes actions valued by the market (Harmsen, Grunert, & Declerck, 2000). Product oriented firms need to be competent in understanding its customers and ensure that customers recognise the production possibilities facilitated by its processes.

The measurement of consumer needs and purchase interest may be valid for screening continuous innovations and market orientation induces businesses into being interested in short term customer needs which can be detrimental to innovation and long-term success of a company (Tse, Sin, Yau, Lee, & Choe, 2003). Jaworski and Kohli (1993) suggest that market orientation might be an antecedent to innovation and market–oriented organisations tend to be more innovative (Liu, Luo, & Shi, 2002). Explicit definitions of innovation by Zahra and Covin (1995) suggest that Innovation is widely considered as the lifeblood of corporate survival and growth. Innovation is recognised to play a central role in creating value and sustaining competitive advantage. Bessant (2005) on the role of innovation in renewal and growth emphasise Innovation represents the core renewal process in any organisation. Unless it changes what, it offers the world and the way in which it creates and delivers those offerings it risks its survival and growth prospects (Baregheh, Rowley & Sambrook, 2009).

Whilst there is some overlap between the various definitions of innovation, overall the number and diversity of definitions leads to a situation in which there is no clear and authoritative definition of innovation. As early as 1984, Ettlie, Bridges, & O'keefe (1984) commented on the problems for research and practice of innovation arising from this disciplinary void. Zairi (1994) and Cooper (1998) have suggested that one of the challenges of innovation is the lack of a common definition, which undermines understanding of the nature of innovation. A general definition adaptable to different disciplines and covering different aspects of innovation would be beneficial as the term innovation is notoriously ambiguous and lacks either a single definition or measure (Adams Bessant, & Phelps, 2006).

Innovation is tightly coupled to change, as organisations use innovation as a tool in order to influence an environment or due to their changing environments (internal and external) (Damanpour, 1992). However, innovation may involve a wide range of different types of change depending on the organisation's resources, capabilities, strategies, and requirements. Common types of innovation relate to new products, materials, new processes, new services, and new organisational forms (Ettlie & Reza, 1992). These different forms of innovation draw to varying extents on different teams, departments, and professional disciplines. As Damanpour and Schneider (2006) state innovation studies in many disciplines and has been defined from different perspectives.

Damanpour (1996) provides a detailed definition of innovation is conceived as a means of changing an organisation, either as a response to changes in the external environment or as a pre-emptive action to influence the environment. Hence, innovation is here broadly defined to encompass a range of types, including new product or service, new process technology, new organisation structure or administrative systems, or new plans or program pertaining to organisational members. Other variations in the definition of innovation arise from different disciplinary perspectives. In knowledge management, the focus is on knowledge being vital for innovation or even a type of innovation. As Du Plessis (2007) notes innovation as the creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal business processes and structures and to create market driven products and services. Innovation encompasses both radical and incremental innovation. In technologically related definitions, the main focus is on innovation being a product related to new technology (Nord & Tucker, 1987).

A consensus on the definition of innovation offers a way forward for the identification of innovation within organisations and countries. The typology of innovation, implicit in our diagrammatic definition offers a means of classifying innovations. For example, there is the opportunity to classify definitions based on whether they bring forward into something new or improve an existing aspect of the organisation (nature). Similarly, innovations may be classified as product, service, process or technical (type), and the resources or means used to drive and support innovation can be identified in respect of the balance of technology, ideas, inventions, creativity, and market (means). This type of analysis would be useful for businesses in strategy and planning, and would offer a useful framework for comparing different innovation processes in different organisations, towards knowledge-building (Baregheh at al.,2009).

Intense global competition, rapid change of technology and higher consumers demands have prompted organisations to look for competitive advantage for survival (Black & Synan, 1997). Innovation is regarded as an important mechanism to be more competitive and to survive in the global business world (Salaman & Storey, 2002). Innovation provided companies with several strategic advantages such as eliminating costs, differentiation through new product and services development and increased quality (Yeşil, Koska, & Büyükbeşe, 2013). Scholl (2005) stated that if there is no innovation, then no one can speak of growth and competitiveness.

Schein (1994) recognised that the definition of invention is a major problem, but nevertheless defines innovation as fresh ideas, trend in behaviour, values, beliefs and conjectures that span the organisation's daily operations. Innovations classified into two main groups; the first group is content innovation, which includes new products, services, and ideas espoused in the mission of the organisation; and the second group is role innovations, which includes new ways of doing things, redefined roles, and new strategies for accomplishing the roles (Schein, 1970; Van Maanen & Schein, 1979). Elsewhere, researchers like Daft, 1978; Damanpour & Evan, 1984; Damanpour, Szabat & Evan (1989) defined innovation as the acceptance of an idea, process, or practice that is recent to the firm.

In addition, Dosi, (1988) conceptualised innovation as a process that involves three interrelated stages. The first stage is invention, followed by innovation and lastly diffusion. Invention is the nuisance of a new concept, product or process that may not fundamentally have an economic value, while innovation, which is the next stage, is the mobilisation of the invention to make it usable. Usability is the capability of the refined function of an invention to generate revenue by satisfying the user's requirements. Finally, the final stage, which is diffusion can be explained as the process in which innovation is mobilized from business industries for the consumer and accepted by the customers. It is also can be described as innovation adoption (Rogers, 1995). In search of a consensus, an Advisory Committee established by the US Department of Commerce, whose panellists included both academics and industry experts (Schramm, 2008; Karanja, 2011), issued a report in which it defined innovation as the series of tasks including design, invention, construction and/or application of refined products, processes, services, systems, structures of the organisation, or business framework to create new benefits for users and customers and provide profits to the firm.

For instance, by arguing that the number of research and development acts as a surrogate of the innovative competence, especially in advanced technology sectors, Duysters & Hagedoorn (2001) and Henderson & Cockburn (1994) defined innovation as the research and development expenditures at the firm level. Other researchers who have used research and development expenditures as innovation indicators have gone a step further and disaggregated it into various components that include the resources devoted to the hiring and training of scientists and engineers (Scherer, 1965). The most popular benchmark used to represent innovations made by a firm is through patent counts, and researchers have argued that patent count is a good guide to measure firm's inventive performance. It can also reflect the new technologies and process adopted (Acs & Audretsch, 1989; Ahuja & Katila, 2001; Bresman, Birkenshaw & Nobel, 1999; Duysters & Hagedoorn, 2001; Griliches, 1998; Josh & Julie, 2007; Shan, Walker & Kogut, 1994).

Continuing on the definitions of innovation, some researchers have signified that the quality of a patent is reflected in the number of times that the patent is cited. Some researchers use the cited patent counts of a company to define innovation (Gambardella, Harhoff & Verspagen, 2008; Harhoff, Narin, Scherer, & Vopel, 1999; Jaffe, Trajtenberg & Henderson, 1993; Karki, 1997; Rosenkopf & Nerkar, 2001; Stuart, 2000; Silverberg & Verspagen, 2006; Trajtenberg, 1990). Other researchers have defined innovation in terms of new product announcements by the firms (Devinney, 1993; Hitt, Hoskisson, Johnson & Moesel, 1996; Katila & Chen, 2009), or the new product counts made in a specified amount of time by the firm (Bruno & Reinhilde, 2006). For example, Laursen and Salter (2006) used a subset of data that were collected by Core Eurostat Community Innovation Survey (CIS) describing innovation. Innovation was defined as goods and services introduced to the markets, which are either new or significantly improved with respect to fundamental characteristics, and the innovation should be based on the results of new technological developments, new combinations of existing technology or utilisation of other knowledge (DTI, 2003).

Katila and Shane (2005) described an innovation attempt as an effort by a firm to commercialise a licensed invention, and measured innovation through two end results: the first is the possibility of a licensed-firm selling a product made with a licensed design and the possibility of a licensed-firm abandoning the invention license without any sales. Thus, taken together, innovation is a process through which firms provide new products and improved inventions, services and processes that are either physical in nature or are included in patents and is also a key driver in the firm's growth through productivity improvement, customer surplus, increased profitability, or generation of new markets. As such, innovation is envisioned as an organisation or industry transformation process aimed at responding to either internal or external environmental turbulence or as a pre-emptive move meant to influence the external market environment (Mahoney, 2005; Penrose, 1959; Schumpeter, 1976). Therefore, based on all the definitions above, it appears that the definition of innovation gravitates toward a new artefact; tangible or intangible, that has the capability to satisfy user's demand while concurrently generating financial benefit to the inventor. Another definition to describe innovation is the numerical sum of patents awarded to each firm as well as the number of patent citations associated with the granted patents. This concept of innovation has been extensively utilised in other empirical studies (Bessen, 2006; Duysters & Hagedoorn, 2001; Gambardella at al., 2008; Griliches, 1998; Hall, Jaffe & Trajtenberg, 2005; Hegde & Sampat, 2009; Josh & Julie, 2007; Lanjour & Schankerman, 2004; Silverberg & Verspagen, 2006).

Among the various activities that innovation entails are idea origination, research and development, commercialisation, and diffusion of the innovation in the marketplace. Innovations can have significant effects without necessarily embodying a breakthrough. Many innovations have been credited with furthering technological advancement as a result of solutions to production and marketing problems, and not direct opportunities for research and development (Nelson, 1992). However, for an invention to be considered an innovation it has to be integrated into the economy, or the invention must have an economic or monetary value. For instance, the knowledge created during the invention process is applied in production to increase productivity and product quality or yield a newly created products and services as well as improved existing products an economic monetary value, also called appropriability, thus stimulating economic growth (Roberts, 1999; Roberts & Amit, 2003).

The appropriability of an innovation refers to the factors that are not related to the firm or structure of a market that regulates the ability to gain profits by an inventor from a specific innovation (Chesbrough, Vanhaverbeke & West, 2006; Teece, 1986). These factors are dependent on the industry level of competition as well as the type of information related to the innovation. If there is more competition within the industry and the innovation consists of basic knowledge, then the less the appropriability and vice versa. Outputs of innovation can be characterised as the accomplishment by an organisation after extending its research and development programs, and the corresponding processes that eventually resulted in ideas, idea illustrations, modelling of the device, processes, products and system, (Hagendoorn & Cloodt, 2003). The ability to be persistent innovators is a key driver of success (Scherer, 1965, 1980, 1992; Yusuf, 2002; Karanja, 2011).

The marketing literature on organisational innovation uses many terms interchangeably- innovation, innovativeness, and new product innovation. Damanpour (1992), and Garcia and Calantone (2002) provided an integrated definition for innovation. In their words, one of the definitions of innovation is a continuous process triggered by the concept of possible opportunity for inventions incorporating the latest technology in the new market, new products or new services or by the perception of making improvements in the extant processes of production. This definition, which has been hitherto adhered to by scholars in the field posit innovation in the light of its potential to generate new rents for the firm by enhancing or adding products and services. This may be because of the strong representation of manufacturing studies as the context within which seminal studies in innovation have been based on.

Studies have investigated how industry characteristics and organisational structure affect innovation in the firms. For example, scholars have assessed the influence of level of formalisation in organisational structure and the level of centralisation in decision making on innovation (Daft, 1992; Damanpour, 1991; Kimberly & Evanisko, 1981; Wolfe, 1994;). As more research is carried out on innovation, more focus is given towards intangible resources as opposed to the tangible resources. For example, a firm employing employees with exceptional knowledge and technical skill, human capital with high aptitude in research and development activities, and readiness to embrace high-risk ideas and activities will highly likely to propel the firm in producing quality innovations (Del Canto & Gonzalez 1999; Huiban & Bouhsina, 1998; Kessler & Chakrabarti, 1999; Song & Parry, 1996).

For the economic models, the focus is typically placed on product innovation. It is distinguished further into two specific types (Gancia & Zilibotti, 2005; De Mel, McKenzie

& Woodruff, 2009). For economic models of innovation, the focus is typically placed on product innovation. Horizontals innovation, which is the first type involves the production of new products that does not interfere with the current and existing products to market, which will expand the selection of products produced by a firm. Romer's Growth Model (1990); De Mel et al., (2009) included this form of innovation in its model. The second classification is vertical innovation, in which the existence of new products renders the existing products obsolete. As highlighted by Schumpeter (1934), the second type of innovation involves the process of creative destruction and became the basis Agion and Howitt (1992) growth model.

In some studies, innovation in business is described as recognition of new ideas, practices, artefacts or behaviour adopted by the users (Zaltman, Duncan, & Holbek, 1973; Daft, 1978; Tushman & Nadler, 1986; Damanpour, 1991; Tarafdar & Gordon, 2007). The literature studies distinguish the innovations into two; technical innovations which involve updated technologies, services and product. The second one is administrative innovation, which involves processes or methodology, organisational forms and policies (Daft & Becker, 1978; Damanpour 1987; Kimberly & Evanisko, 1981).

Edwards and Gordon (1984) as well as Thornhill (2006) described innovation as series of process that started with an idea followed by the development of the idea into an invention resulting in the introduction of a new outcome (products, services, process or service) to the market. An organisation's entrepreneurial potential can be reflected by the innovative practices, initiated by any individual in the organisation (Naman & Slevin, 1993; Lumpkin & Dess, 1996). According to Miller (1983), an entrepreneurial firm is one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with proactive innovations, beating competitors to the punch.

Another alternative definition for innovation is described as the introduction, acceptance, and implementation of new ideas or activities that are not common or new to the organisation (Daft, 1978; Fichman, 2001; Pierce & Delbecq 1977), and involves recognising and utilising opportunities to come out with new lines of products, services or practices (Tushman & Nadler. 1986; Van de Ven, 1986). Upon confronting competition, one of a firm's main problems is whether to adopt a development strategy that is more aggressive via practices of service innovation. Earlier research on innovation of services proposed that the service itself is a form of products or at least constitute of a product and it was advised to manage the development as a new product for the company providing the services (Easingwood, 1986). In the recent years, focused have been broadly placed on the service itself Researchers investigated the rising issues in the process of the development of new services, for example, the participation of customers (Magnusson, Mathing, & Kristensson, 2003; Martin & Horne 1993, 1995), the signification of creation of new ideas, filtering and development (Alam & Perry 2002; Barczak, 1995). Other researchers suggested that the other crucial elements to innovation development are communication (Lievens, Moenaert, & Jegers, 1999) and learning of the project (Blazevic, Lievens, & Klein, 2003; Blazevic & Lievens, 2004). To conclude, in order to conjure up new markets, specific innovation of services must be implemented by organisations to construct business models, administer the customer requirement and satisfaction, oversee employee accomplishment and accommodating the organisation with the innovation of the managerial process (Atuahene-Gima, 1996; Berry, Shankar, Parish, Cadwallader, & Dotzel*,* 2006).

Another perception of innovation was provided by Robertson and Yu (2001), the perceived newness of the idea from the individual's point of view determines his or her reaction to it. If the idea seems new to the individual, it is an innovation. Tyler (2001) suggested innovation constitutes of specific technical knowledge in order to achieve improvement. Products that are developed innovatively can create opportunities in growth and can expand the firm's market into new areas. Apart from that, it can also provide the firm with a competitive edge. As stated by Calantone et al., (2002), the process of innovation consists of acquiring, distributing, and utilising new knowledge as well as implementing new ideas within a firm or an organisation. It has been widely agreed that learning condition, organisation entrepreneurship, and the innovativeness of firms a tightly webbed together and many researchers have studied the correlation (Hurley & Hult, 1998; Liu et al., 2002). Entrepreneurship of a corporate body stresses on the research and investigation that integrates innovation, adopting risk and dynamism (Baker & Sinkula, 1999), and providing competitive edge for a firm in challenging markets (Erdil et al., 2004).
Profound innovations can place a firm in a comfortable leading position in a market domain and provide new firms with strong competitive edge in the market. In order for innovation

to occur, risky moves must be faced, and more firm resources must be prepared. There are a few constituents that make up the process of innovation. The first one is the production process innovativeness; customer's and firm's perspective of innovation towards a product are to be examined (Victor et al., 2000). The next one is organisation of work and workforce management (Baer & Frese, 2003). Success is imminent for firm's innovativeness in producing products and services if they carry out practices and activities that are demanded by the market (Harmsen et al., 2000). Firms that are product-oriented must be competent in comprehending customers' needs and to ensure that they acknowledge the possibilities of production assisted by the process.

Nationwide surveys concerning innovation have been carried out at a macro level in the recent years. Organisation for Economic Cooperation and Development (OECD) developed the most methodological foundation to gather data related to innovation at firm-level, known as 'Oslo Manual'. A certain set of basis and guidelines are provided in the manual for nationwide surveys spanning a wide array of elements of innovation practices (Erdil et al., 2004; Evangelista, Iammarino, Mastrostefano, & Silvani, 2001).

The summary of some of the main areas of investigation of the Oslo Manual are as follow:

a. The innovation classification (either process innovation or product innovation);

b. The resources and asset invested in the innovation.

c. The implementation of particular strategies of the firm

d. The channel for the firms to obtain and interchange technological information;

e. The flow of technological information within firms; and

f. The impact on sales and exports after innovation activities are implemented

In the Oslo Manual, the generic definition of innovation can be divided into four subcomponents and can be found as follow:

a. Product innovation: the establishment of new or significantly improved products or services

b. Process innovation: the installation of new or majorly improved production or delivery method.

c. Marketing innovation: the employment of a new marketing strategies and practices involving major changes in the design of products

d. Organisational innovation: concerns the establishment or adjustment of business activities, workplace organisation, or external relations.

Further, Lyytinen and Rose (2003) distinguished innovation of service process as services that: (1) support the foundation of an administration which is also known as administrative process innovation; (2) technological process innovation which support the function process of an organisation; (3) enlarge and support user interfacing operations which is also known as technological service innovation;(4) support processes and operations within an organisations (technological integration innovation). Innovation of process can be described as the change in the production methods or the change in the way a firm provides its service (Robey, 1987; Tarafdar & Gordon, 2007; Zmud, 1982). According to Davenport (1993), organisational process innovation is the installation of new practices, methodology, procedures or responsibilities. It also includes acquirement of new knowledge and expertise and new ways to manage and organise a company (Robey, 1987).

Innovation refers to the firm's tendency and receptivity to adopt ideas that deviate from the ordinary course of business (Menguc & Auh, 2006). Innovation implies the willingness to give up old habits and try the untested ideas (Tsai & Yang, 2014). This concept is further seen as a firm's orientation to technological development, development of new products and services and/or improvement of production and other business processes in order to achieve competitive advantage (Dibrell, Craig, & Neubaum, 2014). Innovation is a process that begins with an idea, proceeds with the development of an invention and results in the introduction of a new product, process or service (Thornhill, 2006). It is widely recognized that technological change and innovation are the primary engines of economic growth and lie in the centre of the competitive process.

Product innovation and process innovation are the two popular categories that are usually raised in many studies (Avlonitis, Papastathopoulou, & Gounaris, 2001; Crawford & Benedetto, 2002; Gadrey, Gallouj, & Weinstein, 1995; Gallouj & Weinstein, 1997; Hertog, 2000; Hipp, Tether, & Miles, 2000; Lyytinen & Rose, 2003; Uchupalanan, 2000). As an example, four groups of service innovation, according to context of service have been established by Gadrey et al., (1995). The four types are; service products innovation, architectural innovations of existing products (bundled or un-bundled), innovations that were derived from the adjustment or improvement of an existing service product, and lastly, innovations adopted by organisations in carrying out their business processes for the current service product that they have in the market. Nevertheless, according to most authors of earlier studies, product innovation and process innovation are considered as two main innovation categories (Akgün, Ince, Imamoglu, Keskin, & Kocoglu, 2014; Cefis and Marsili, 2012; Mavondo, Chimhanzi, & Stewart, 2005; Turulja & Bajgoric, 2018). Product innovation focuses on the market and the customers, whereas process innovation focuses on the internal firm's processes and at increasing efficiency (Alegre & Chiva, 2013; Dorson, 2018). Thus, it is considered a firm's innovation as product and process innovations separately.

2.4.1 Process Innovation

Process innovation refers to the introduction of new methods or procedures in a production that includes new approach in handling a commodity in commercial sectors (Schumpeter, 1934). This definition can be envelope the whole of the value chain process which includes production, processing of data, service and distribution (Işik et al., 2013; Zaltman et al., 1973). Favourable effects may impact on the operational process internally by adopting information technology as well as external inter-enterprise processes that embrace other organisational process (Joglekar & Yassine, 2002). By adopting information technology, a firm's sensitivity towards customer demands can be enhanced. It means the firm will highly likely to respond to customer need within a shorter amount of time (Jackson, 1989), and costumer will have the opportunity to keep track of their deliveries (Tinnilä & Vepsäläinen, 1995). Aside from that, looking from the external point of view, firms do not only enhance productivity visibility, but also can gain benefits by employing information technology in creating or improving new service processes (Avlonitis et al., 2001), for example by using the internet platform via various mediums such as mobile services, customer may conduct inquiry, making purchase through internet. Moreover, after sale service an inquiry is being purchased in the internet service development efficiency and administrative capabilities can be improved by adopting information technology into its business framework (Karagozoglu & Brown, 1993). Ozer (2000) added that communication, collaboration and coordination within the firm can also be improved.

Process innovation refers to performing a business activity in a new and innovative way (Akgün et al., 2014). Banu Goktan and Miles (2011) define the process as a specific, structured ordering of business activities designed to produce accurate outputs. The process innovation involves the implementation of new or significantly improved production, delivery methods and other business processes. The goal of process innovation can be a reduction in unit costs of production or delivery or increase in the quality of products or services. Gunday et al., (2011) point out that, while the introduction of new products assumes to have a clear, positive impact on the growth of income and employment, process innovation, due to their nature, can have ambiguous effects. Thus, the process innovation means being innovative in any process related to the design and product development.

Process innovation can be perceived at the level of improvement of business processes as well as the level of new approaches and business process development (Dorson, 2018; Turulja & Bajgoric, 2018).

2.4.2 Product Innovation

Product innovation refers to the installation of novel goods or improved quality of the existing products (Schumpeter, 1934). It covers the construction, production and dispersion of new users and capitals (Işik, et al., 2013; Zaltman, et al., 1973). Service products are usually easier to be copied compared to physical goods and more difficult to be placed under commercial patent protection. Nevertheless, in order to remain competitive, it is important for service firms to continuously innovate their products. Marketing staff can enhance their productivity in innovating new services if information technology is adopted into a company (Vermeulen & Dankbaar, 2002). Software that provides information technology management and business intelligence can help employees learn from past innovation carried out by the company and subsequently improve their marketing strategy using the lesson learned. By performing this, organisations are able to develop new services that cater the current market requirement better. It also provides better post-marketing assistance to meet user's requirements (Demirhan, Jacob, & Raghunathan, 2006; Preissl, 1999).

Product innovation is related to the development of new or improved products and/or services and their successful introduction into the market (Naranjo Valencia, Sanz Valle, & Jiménez Jiménez, 2010; Wang & Ahmed, 2004). Product innovation is a novel product which is distinctly different from the previous one (Herrmann, Tomczak, & Befurt, 2006). Product innovation involves the introduction of a product or service that is new or significantly improved. A degree of product innovation is determined by its newness to a firm that developed the product or in the industry that the firm operates in and around the world (Banu Goktan & Miles, 2011). Product innovation can be measured by the level of introduction of a new product as well as with the novelty level of customers' perception about new products. Product innovation implies increased benefits for the customer regarding functionally or other improvements in the product or service (Zaefarian, Forkmann, Mitręga, & Henneberg, 2017). This type of innovation is tightly linked to the primary activity of a firm (Dorson, 2018; Naranjo Valencia et al., 2010; Turulja & Bajgoric, 2018).

2.5 Competitive Environment

According to Schwanitz, Muller, & Margret Will (2002) in Karaev, Lenny Koh, & Szamosi (2007), competitiveness means the abilities of individual firms, or whole sectors, regions and even countries successfully to assert themselves in the domestic and global market. It is obvious within the capitalist system that businesses survive and thrive through successful competition (O'Connor, 2003). The concept of the competition itself is being redefined

(Cronin & Crawford, 1999a, 1999b; Shapiro & Varian, 1999; Von Krogh, Ichijo & Nonaka, 2000 all in Bergeron & Hiller, 2002) with a competitor-focused strategy becoming increasingly viewed as essential for survival. A focus on only the competitive environment might be perceived as a straitjacket hampering an organisation's capacity to develop advanced strategies based on creativity and innovation (Von Krogh et al., 2000 in Bergeron & Hiller, 2002). Competitiveness is a multidimensional concept that refers to the ability to create sustainable competitive advantages that can be used at the national, industry and firm level (Vilanova, Lozano, & Arenas, 2009 cited in Marín, Rubio & Maya, 2012). At the firm level, competitiveness is described as the ability to produce goods and services creating value or to act against the rivalry originated in the relationship with other firms (Porter, 1996 in Marín et al., 2012). As a concept restricted to competitive markets, the relative position against rival agents is a key determinant of the differences between successful and unsuccessful organisations (Porter & Kramer, 2006 in Marín et al., 2012; Maune, 2014).

Some define competitiveness as a condition, whereas others define it as an attitude. Competitiveness is a multifaceted concept and according to Schuller and Libom (2009) in Sewdass and Du Toit (2014), competitiveness refers to the competitive environment that a country's companies face. O'Connor (2003) states that competitive may be defined in a variety of ways. It could describe the state, or condition, of an industry or a firm. It could describe an approach to business. It could be seen as a measure of performance. The central question arises: who decides if a company is competitive? A number of answers to this might be proffered. For example, governments might define a company as competitive if it conforms to the criteria contained within the competition or anti-trust law. Managers might define competitiveness in terms of market share, profitability and growth. It is clear that the definition will vary with differing points of view and with the nature of the viewer's interest in the performance of a business (O'Connor, 2003).

Dill (1958) pioneered the first study on the relationship between competitive environment and organisations based on task and general environments. The task environment consists of sectors that are closer to organisations (such as customers, suppliers and competitors) but are more complex whereby a given firm or organisation must communicate for its own business growth and survival, and insight about business opportunities and challenges are more feasible to be accessed. In contrast, the general environment is less complex and is usually related to corporate level strategy but may experience indirect consequence on organisational performance (Bourgeois, 1980; Jaharuddin, 2012). In a well-known study by Porter (1980), competitive environment is not only limited to competitors, but also contains the underlying economic and competitor's forces, such as threats of new entrants, suppliers, customers, and substitute products. Fahey (1999) and Weiss (2002) shared a similar view by mentioning how detecting, anticipating, and understanding the competitive environment is important.

According to Dess and Beard (1984), environment condition also known as objective environment comprises of three dimensions; complexity, dynamism and munificence.

Whereas, Jaworski and Kohli (1993) have conceptualized external environment factors to comprise market turbulence, technological turbulence, and competitive intensity. Lumpkin and Dess (2001) exerted that many conceptualizations of environment are consistent with the conceptualization developed by Dess and Beard (1984). Although the concept is widely discussed and regarded as a fundamental concept in the management theory, there is little consensus regarding the conceptualization and measurement of the construct (Boyd, Dess, & Rasheed, 1993; Fuentes-Fuentes, Albacete-Sáez, & Lloréns-Montes 2004; Nazri, 2015).

In previous studies, the dimensions of dynamism and hostility are the most commonly used environmental spectrums (Hough & White, 2003; Lumpkin & Dess, 2001; Moreno & Casillas, 2008; Wiklund & Shepherd, 2005; Zahra & Garvis, 2000). A few variables such as organisational strategy, structure of the organisations, decision making pattern of top management, and corporate entrepreneurship have all been discovered to be different and are dependent on the nature of the environment encountered by the firms (Wiklund & Shepherd, 2005). Furthermore, dynamism and market hostility also affect the firms' day to day operations and target achievement and encompasses sectors such as suppliers, customers and competitors (Daft, Sormunen & Park., 1988).

Competitive environment or comparatively environmental turbulence refers to the rate of the unpredictability and highly varied events which occur in the environment in which a particular industry operates (Kam-Sing Wong, 2014; Tsai & Yang, 2014). Environmental turbulence refers to market turbulence, technological turbulence, and competitive intensity.

Several researchers viewed that the environmental dimension will include market turbulence, technological turbulence and competitive intensity (Abd Aziz & Mohd Yassin, 2010; Kirca, Jayachandran, & Bearden,2005; Nazri, 2015; Subramaniam, Kumar, & Strandholm, 2009; Qu & Ennew, 2003; Wang et al., 2012). Market turbulence is delineated as the rate of change in customer preferences and composition (Subramaniam & Gopalakrishnan, 2001). Technological turbulence describes technological change (Kohli & Jawoeski, 1990). Technological turbulence is also viewed as a condition where an organisation can stay ahead through its continuous improvement of products, services and process management (Wang et al., 2012). Competitive intensity is another environmental dimension that becomes the characteristics of external environment (Wang et al., 2012). In this research, the environmental dimension used are market turbulence and technological turbulence.

2.5.1 Market Turbulence

Market turbulence is the rate of change in the composition of customers or their preferences for products and services (Kam-Sing Wong, 2014; Tsai & Yang, 2013; Sheng & Hartono, 2015). In the turbulent markets, firms' customers often change their product preferences or tend to seek new products continually (Dorson, 2018; Hanvanich, Sivakumar, & Hult, 2006; Turulja & Bajgoric, 2018).

Turbulence in an environment can be characterised as unpredictability arising from unexpected changes in market demand and consumer preferences, new technology developments, and technological breakthroughs (El Sawy & Pavlou, 2008). In such turbulent environment, there are three kinds of capabilities that give an impact on the strategic advantage: (1) operational capability (ability to carry out processes), (2) dynamic capability (the projected ability to rearrange and redesign operational capabilities), and (3) capability to improvise (the learned ability to rearrange and redesign operational capabilities spontaneously). In general, the last two capabilities fall under dynamic capabilities. In light of this, it can be established that dynamic capability and competitive benefit are correlated, and they can experience the effect of environmental turbulence (Jaworski & Kohli 1993; Johannesson & Palona, 2010; Mithas, Ramasubbu, & Sambamurthy, 2011; Pavlou & El Sawy, 2006, 2010; Rai & Tang, 2010; Tallon & Pinsonneault, 2011).

Turbulence in market environment is described as the rate at which customer preference and composition changes over time (Subramaniam & Gopalakrishnan, 2001). The business value of combined model of information technology (Melville, Kraemer, & Gurbaxani, 2004) emphasised the influence of industrial firm performance and the features of the correlation between information technology-enabled resources. As for Dess and Robinson (1984), they delineated business environment turbulence as the measure of regularity and the magnitude of change in market variables that are critical. These critical market variables may consist of reconstruction in the condition of the market and technology (Jaworski & Kohli 1993). Mithas et al., (2011) defined turbulence in an environment as a highly competitive environment and loosely described as the general conditions of uncertainty (Rai & Tang, 2010).

2.5.2 Technological Turbulence

Technological turbulence is the rate of technological change in the industry (Huang & Tsai, 2014). Technological turbulence defined as the degree of change associated with product and process technologies in the industry in which a firm embeds (Hanvanich et al., 2006; Turulja & Bajgoric, 2018).

Technological turbulence describes changes in the technological aspects (Kohli & Jawaorski, 1990). Technological turbulence is also viewed as a condition where an organisation can stay ahead through its continuous improvement of products, services and process management (Wang, et al., 2012). With the rising significance of innovation impact and up-to-date technology adopted by firms for its competitive benefit in worldwide markets (Porter, 1986; Scherer, 1992; Murmann, 2003; Schiavone, 2011), the motivating force for offshoring have moved from cost reduction (Bardhan & Jaffe, 2005, Winkler, 2009) to finding access to new knowledge (Bunyaratavej, Hahn, & Doh, 2007; Deloitte, 2004; Farrell, Oczkowski, & Kharabsheh, 2008; Lewin & Peeters, 2006) as well as the scarcity of highly-competent workforce (Lewin, Massini, & Peeters, 2009). A few authors have identified another source of this motive change, which is the rising turbulence in a technological environment resulting, for example, from shorter life cycles of product

(Tassey, 2008; Seppälä, 2013). Nevertheless, technological dynamism has reserved specific research on the function of advances in information technology (Abramowsky & Griffith, 2006; Blinder, 2006; Ernst, 2002; MacDuffie, 2007).

Scholars have also highlighted that technological turbulence has also been highlighted by many scholars as a phenomenon that has numerous features influencing firm environment (Tushman & Anderson, 1986). The literature has emphasised that research should also focus on the technological change uncertainty (in terms of its direction) aside from focusing on the technological change speed (Bourgeois & Eisenhardt, 1988; Eisenhardt & Martin, 2000; Gustaffson & Reger, 1995; Wirtz, Mathieu, & Schilke, 2007). In actual fact, and high uncertainty and high may occur at the same time, although not necessarily so at all instances. One of the fascinating examples is the extensive increase in central processing unit (CPU) processing speed since the last two decades. The famous Moore's law states that the speed of the CPU will double in its number every two years, based on the trend on of transistors miniaturisation. With the existence of a valid law forecasting the trend of technological progress predicts low uncertainty, even though the speed of progress in technology was undoubtedly high. Hence, top management in a firm should make it as a challenge to steer technological turbulence within its company to match with the speed and uncertainties of changes in the technology.

2.7 Chapter Summary

In this chapter, the definitions, background and elements of the variables vital to the subject have been discussed. The variables include business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance. The information infrastructure dimensions could be divided into three which were connectivity, compatibility, and modularity. Innovation involved the process and product innovation in an organisation. Based on the literature, competitive environment that was used in this research market and technological turbulence. Firm performance, on the other hand, could be measured using various variables. The common types of measurements for organisational performance that are often used in studies and performance correlation were, non-financial and growth performances. The next chapter details the theoretical and hypotheses development.

CHAPTER THREE

THEORETICAL AND HYPOTHESES DEVELOPMENT

3.0 Introduction

This chapter provides theoretical rationale and empirical evidence to justify the hypothesized relationship among the variables. Based on a comprehensive literature review conducted for this empirical study relating to the study of interest has become the theoretical bases for this study and it is discussed in this chapter. It also describes the hypothesized conceptual framework for the present study and summarises the proposed hypothesized relationship. The research framework of this study has been developed to evaluate the possible relationships among business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance. This section also discusses the effect of mediating and the moderating variables on the relationship between the independent variables and dependent variables.

3.1 Theoretical Underpinnings

The following sections describe the theories that helped to develop hypotheses and research framework. These theories interweave with each other to form a theoretical foundation for explaining why the research model is valid in theory. The primary theories of the study were knowledge-based theory, resource-based view, and contingency theory. They were adopted to empirically examine on how organisations, by nature, are complex and dynamic entities. Accordingly, these three views were applied to explain how firms embrace business intelligence systems adoption, information technology infrastructure, innovation in reaction to the competitive environment and to contribute to organisational performance.

3.1.1 Knowledge-Based View

Knowledge-based view espouses knowledge as a strategic firm resource which is socially complex, causally ambiguous and hence difficult to imitate (Grant, 1996; Nonaka, 1994; Nonaka, & Takeuchi, 1995; Nonaka, Toyama, & Nagata, 2000). The concept of knowledge can be viewed from various perspectives, with the most popular being that the knowledge-based view is an offshoot of the resource-based view. Under this viewpoint, the concept of resources includes intangible assets and specifically, knowledge-based resources employed a very specific view of knowledge as a useful extension of organisational learning strategy and organisation theory (Grant, 1996; Kogut & Zander, 1992). These findings were enhanced by the work of Sveiby (2001) and White (2007) who introduced the idea of a repository for embedded knowledge throughout an organisation. In particular, this idea was advanced via the knowledge management system and practices in a firm. Essentially, the knowledge-based view also adopts the premise that business intelligence involves converting raw data into actionable knowledge to be used for the formulation of competitive strategy and as a potential source of competitive advantage (Arias Aranda &

Molina-Fernandez, 2002; Cheng, Lu, & Sheu, 2009; Chuang, 2004; Conner & Prahalad, 1996; Elbashir, Collier, & Sutton, 2011; Grant, 1996; Herschel & Jones, 2005; Sveiby, 2001; Wisner, 2003).

Knowledge-based view originated in the strategic management literature (Grant, 1996; Kogut & Zander, 1992; Spender, 1996) but has also permeated other disciplines including management and specific information technology (Alavi & Leidner, 2001; Karanja, 2011; Malhotra & Galletta, 2003; Massey & Montoya-Weiss, 2006).

In Western epistemology, knowledge is viewed as justified true belief, with many theories focusing on the explicit nature of knowledge (Nonaka & Takeuchi, 1995). Thus, while knowing is associated with information processing, knowledge is modelled as an unambiguous and explicit or easily transferable construct. Polanyi (1962) explained the emergence of a newer view of knowledge based on the distinction between explicit and tacit knowledge. The tacit knowledge of a firm is described as a set of organisational routines (Nelson & Winter, 1982; Karanja, 2011), embedded knowledge (Ravetz, 1971), and organisational know-how (Kogut & Zander, 1992). These sets are inimitable and acquired through reflection and practice. Conversely, explicit knowledge is comparatively easy to convey and is transferable between individuals and organisations as it is found in formulae, textbooks, or technical documents (Chyi Lee & Yang, 2000). On the whole, knowledge has the capacity to affect its related societal and cultural contexts.

Under the knowledge-based view, a firm's knowledge bases and capabilities are considered heterogeneous and capable of leading to competitive advantage. Competitive advantage emanates from the set of knowledge and skills possessed by the firm that is useful in facilitating innovations in products, processes, or services. Organisational knowledge is embedded and propagated through multiple firm attributes such as organisational culture, policies, routines, processes, systems, and employees (Nonaka & Takeuchi, 1995).

In many firms, knowledge management initiatives are carried out as part of the business strategy, information technology strategy, human resource management strategy, or combinations of any of these strategies (Karanja, 2011; Addicott, McGivern, & Ferlie, 2006). The efforts extended toward knowledge management efforts are usually for enabling the firms to achieve performance improvements, competitive advantage and innovation. Knowledge management efforts also focus on sharing the knowledge to reduce redundant work, re-inventing the wheel, especially in research and development initiatives, as well as reduce the time for training new employees. Also, when knowledge management efforts are implemented appropriately, a firm benefit in that it retains intellectual capital in spite of employee turnover, and also adapts to the environment and market changes (McAdam & McCreedy, 2000; Thompson & Walsham, 2004).

Knowledge-based view direct the role of knowledge in the firm competitive process but does not specifically lay down how the knowledge should be managed and integrated into the firm business processes to achieve performance differentials. Thus, business intelligence is the range of practices that firms employ in identifying, creating, representing, and sharing insights and experiences (knowledge) within and across the firm boundaries.

Hughes (2005) proposed a theoretical model by positioning business intelligence as a basis for competitive advantage and performance. Furthermore, the knowledge-based view affirms that the knowledge from business intelligence in the form of actionable intelligence is a core competency that allows firms to develop greater strategy and better performance (Barney, 1991; Gilad, 2011; Hamel & Prahalad, 1994; Karanja, 2011; McGonagle & Vella, 1996; Owusu, 2017).

3.1.2 Resource-Based Theory

Penrose (1959) introduced the resource-based theory (RBT) of the firm in a ground breaking research on firm growth. Subsequently, the theory was first mentioned in Wernerfelt's (1984) study and it has progressed to become a prominent theoretical perspective which is applied extensively in the literature of strategic management (Newbert, 2007; Powell, 2001; Priem & Butler, 2001; Rause & Daellenbach, 2002). The prominence of RBT in the field of strategic management is contributed by the increasing importance of understanding a firm performance (Amit & Shoemaker, 1993; Peteraf, 1993; Zott, 2003).

Originated from the strategic management and micro-economics literatures (Penrose, 1959; Rumelt, 1984; Teece, 1986; Wernerfelt, 1984; Karanja, 2011), RBT is currently the dominant corporate strategy theory. RBT is based on the concept that a firm is a collection of resources or capabilities that are geared toward generating economic rents. Resources are either tangible or intangible in nature and include inputs as well as outputs of the production processes such as physical capital, financial capital, patents, talented workforce, as well as external business relationships. Under the RBT, resources that are strategically important to a firm must possess some specific characteristics or attributes. This is because, only a few of these resources have the potential to confer the firm with sustainable competitive advantage. Therefore, there must be some differentiating factors that demarcate resources based on their potential to generate and sustain a competitive advantage (Karanja, 2011).

For example, the information technology infrastructure provides the resources that make feasible innovation and continuous improvement of products (Duncan 1995; Venkatraman 1989). Indeed, information technology infrastructures that enable firms to (1) identify and develop key applications rapidly, (2) share information across products, services, and locations, (3) implements a common transaction processing and supply chain management across the business, and (4) exploit opportunities for synergy across business units represent the type of causally ambiguous resources (Reed & DeFillipi, 1990) that are central to the RBT. Moreover, firms achieve competitive advantage by picking valuable and rare resources as well as building inimitable and non-substitutable capabilities around these resources.

The role of theory is to provide a basis for knowledge and understanding of important relationships in a discipline (Smith & Hitt, 2005). In the field of information technology, theory development is highly important because it is a relatively young discipline in comparison to other social science disciplines. Thus, theories used in information technology should provide important and unique insights that advance the field's understanding of information technology and related phenomena such as innovation and performance.

The RBT of the firm played a major role due to its effectiveness in determining the factors influencing particular firm performance (Amit & Shoemaker, 1993; Peteraf, 1993). Barney (1991) explained that the RBT is a strategic management tool which identifies the strategic resources that may generate competitive advantages in the long term. In turn, Barney (2011) elaborated that this refers to the ability to produce higher economic value compared to rival firms. For intense competitive advantage may be achieved if a firm adopts strategies that utilise its internal strengths fully.

Barney (2001) outlined that the RBT has two basic assumptions. Drawing on the work of Penrose (1959), firms are assumed to be various sets of dynamic resources and each firm has unique resources. The firms can be said to be heterogeneous in terms of capabilities and resources. Therefore, every firm has unique core competencies and dissimilar resource profiles (Amit & Schoemaker, 1993). As a result, each firm may not be able to comprehend the strategies of other firms. Second, the resources of a firm are not transferable seamlessly across firms (Barney, 1991). A firm's particular resources may be deemed as its strength and potential sources of competitive advantage under several circumstances: (i) if a firm manages to use those resources to neutralise its threats and exploit environmental opportunities, (ii) if only several rival firms have those limited resources, (iii) if it is expensive to copy such resources, and (iv) if the supply of the resources is inelastic.

Barney (2011) explained that the resources of a firm cover all aspects under its control such as (i) capabilities, (ii) assets, (iii) organisational processes, (iv) information, (v) firm attributes, and (vi) knowledge. Furthermore, there are four major categories to classify these resources, namely the physical capital, financial capital, organisational capital, and human capital. Physical capital can be described as the technologies that a firm use, including its strategic location, its access to raw materials, and its plants and machineries. Moreover, financial capital covers all money resources available for the conception and implementation of strategies. For instance, the sources of financial capital for public listed firms are banks, shareholders, and the public who purchased the firm's shares.

Apart from that, organisational capital is defined as the attributes of a collection of entities like the organisational structure of a firm which includes informal and formal reporting, culture, reputation, and coordinating system. Finally, human capital refers to the intelligence, experience, training, judgements, relationships, and insights of distinct employees and managers in a particular firm. Notably, the effectiveness and efficiency of the strategies of a firm are determined by these resources (Barney, 2011; Daft, 1983). In addition, Wernerfelt (1984) regarded the resources of a firm as a reflection of its strengths and weaknesses. Particular kinds of resources may potentially produce a competitive advantage for a firm; in due course, this results in superior firm performance (King, 2007; Miller & Ross, 2003; Morgan, Kaleka & Katsikeas, 2004; Priem & Butler, 2001; Wernerfelt, 1984; 1995).

Basically, the resource may be categorised into intangible and tangible resources. Intangible resources refer to feats such as acquisition, entrepreneurial orientation, appropriate organisational design, organisational culture, reputation, knowledge, and skills (Runyan, Huddleston & Swinney, 2006; Ferreira, Azevedo & Fernández, 2011). Meanwhile, tangible resources are described as the firm's physical items like raw materials, assets, locations, access to capital, equipment, and facilities (Barney, 1991; Carmeli, 2001). Carmeli (2001) stressed that intangible resources are not normally observable on balance sheets. Competitors may easily copy tangible resources which may be changed frequently, but it is practically impossible to imitate intangible resources.

The resources of a firm are considered as valuable when they can be utilised to execute strategies for the improvement of the firm's effectiveness and efficiency (Barney, 1991). Such strategies may lead to better performance as the firm would capitalise on opportunities and is better prepared to anticipate threats from its environments. Accordingly, the firm may minimise its costs while staying ahead of its competitors. A firm may attain valuable resources by preparing and developing effective combination to process the valuable resources (Penrose, 1959). Consecutively, the firm must process its raw resources to enhance their utility in order to generate improved outcomes (Rubin, 1973). Makadok (2001) added that a firm must gather superior resources compared to its competitors and leverage on their advantages in a more effective manner. In short, the value of a firm's resources has a direct link to its competitive advantage and organisational performance.

A firm's competitive advantage may be sustained using a valuable strategy that is not adopted by numerous competitors at the same time. Conversely, no competitive advantage would be gained if other firms employ similar strategies and use their capabilities and resources in the same manner. Therefore, effective and unique combination of resources must be formulated to adopt a strategy that cannot be copied by other firms. A firm may also combine resources from organisational capital, human capital, and physical capital in their implementation of strategies. Other firms would not be able to or find it difficult to imitate this unique combination of resources as they do not possess the same resources. Barney (1991) highlighted that firms with rare and valuable resources will certainly get the strategic innovator and first mover advantages.

A firm is considered to have perfectly inimitable resources if other firms may not obtain the same resources (Barney, 1991; Lippman & Rumelt, 1982). In order to produce perfectly inimitable resources to gain competitive advantage, all of the following conditions must be fulfilled: the resources must be valuable, impossible to imitate, rare, and dissimilar to other resources or difficult to substitute (Barney, 1991; Haines, 2004). Therefore, other firms will not be able to adopt exactly similar strategies. In order to realise superior performance, a firm needs to have the capability to invent, obtain, and execute strategies. Besides, it must be able to use its abilities to achieve sustainable competitive advantage.

Grant (1991) opined that such competitive advantage is sourced from the firm's capability to wholly utilise its resources strategically. Conceptually, the capability is described as the firm's capacity to coordinate and integrate a combination of numerous resources via strategic processes to produce greater performance (Amit & Shoemaker, 1993; Grant, 1996; Prahalad & Hamel, 1990). It is critical to note that the resources and capability of a firm refer to two distinctive concepts. As explained by Makadok (2001), capabilities are defined as the detailed characteristics of a firm and its processes that are rooted in the organisation. However, ordinary resources embody the opposite concept (Makadok, 2001). In the event that an organisation is dissolved, capabilities will also vanish, but resources may continue to exist under new management. Therefore, the importance of resources that are rare, valuable, and expensive to imitate must be supported by all firms (Barney, 2011).

RBT is underlying theoretical paradigms that have been used in studies relating information technology to organisational performance (eg; Barney, 1986, 1991; Grant, 1991; Kraaijenbrink, Spender, & Groen, 2010; Karanja, 2011; Melville et al., 2004; Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984). RBT postulates that firms are a bundle of resources, and that some of these resources are valuable, rare, inimitable, and non-substitutable (see also table 3.1). Moreover, firms achieve competitive advantage by picking valuable and rare resources as well as building inimitable and non-substitutable capabilities around these resources.

Table 3.1:
Sample Studies that have Used Resource-Based Theory of Information Technology as The Underlying Theory and their Related Constructs

Author(s)	**Title**	**Dependent Variable(s)**	**Independent Variable(s)**	**Unit of Analysis**
Bhatt & Grover, 2005	Types of IT capabilities and their role in competitive advantage (CA): An empirical study.	CA (3 years, ROA and ROS)	IT Capabilities, Organisational learning	202 U.S. Manufacturing Firms (Survey)
Powell & Dent-Micallef, 1997	IT as CA: The role of human, business and technology resources.	CA (IT and Financial Performance)	IT resources, Business Resources and Human Resources	60 firms in US Retail Industry (Survey)
Bharadwaj, 2000	A resource-based perspective on information technology capability and firm performance: An	Firm performance measures (ROA, ROS, COGS/Sales, PER INC/Assets, OPER	IT Capability (Rank in IW500)	56 IT leader firms in US (Secondary) 1991- 1994

	empirical investigation.	INC/Sales, OPER INC/Emps, SG&A/Sales, OPER EXP/Sales)		
Tanriverdi, 2005	Performance effects of IT synergies in multi-business firms.	Tobin Q, ROA and ROA (3 years)	IT resources and management processes	356 Fortune 1000 firms (Survey and Secondary)
Zhuang & Lederer, 2006	A resource-based view of electronic commerce.	Firm performance (financial performance and sales growth)	E-commerce, Human, Business Resources, and E-Commerce performance	458 US Retail outlets (Survey)
Saeed, Grover, & Hwang, 2005	The relationship of e- commerce competence to customer value and firm performance: An empirical investigation.	Tobin's Q and Economic value added	E-commerce competence, Customer value	107 e-commerce firms (Survey and Secondary)
Armstrong & Sambamurthy, 1999	Information technology assimilation in firms: The influence of senior leadership and IT infrastructures.	Quality of senior IT leadership, IT infrastructure sophistication, organisational size	IT Assimilation	153 multi industry US large and medium firms (Survey)
Bharadwaj, 2000	IT capabilities: Theoretical perspectives and empirical operationalizations.	IT Capability	IT Business process Integration, business IT thinking, IT management, external IT thinking, IT business	208 U.S. firms (Survey)

			partnerships	
Bharadwaj, Bharadwaj, & Konsynski,1999	Information technology effects on firm performance as Measured by Tobin's	Tobin's Q	Firm-specific factors not associated with IT, and industry structure variables	631 U.S. large firms (secondary 1989-1993)
Zhu & Kraemer, 2002	E-commerce metrics for net-enhanced organisations: Assessing the value of e-commerce to firm performance in the manufacturing sector.	Firm performance (profitability, cost reduction, and inventory efficiency)	E-commerce capability and IT infrastructure	260U.S. Manufacturing Firms (Survey and Secondary)
Santhanam & Hartono, 2003	Issues in linking IT capability to firm performance.	Firm performance (profit and cost ratios)	IT Capability (Rank IW500)	56 U.S. large firms (secondary 1991-1994)
Zhu & Kraemer, 2005	Post-adoption variations in usage and value of e-business by organisations: Cross-country evidence from the retail industry.	Technological competence, organisation context, environmental context	E-Business Use, E-business value	624 retail industry firms in 10 countries (Survey)
Ray, Barney, & Muhanna, 2005	Information technology and the performance of the customer service process: A resource-based	Performance of the customer service process (IT Labour technical skills, Generic ITs, Shared Knowledge, IT	IT resources and capabilities	72 life and health insurance U.S. firms in 2000 (Survey)

	analysis.	Infrastructure flexibility)		
Ravinchandran & Lertwongsatien, 2005	Effect of information systems resources and capabilities on firm performance: A resource-based perspective.	IS resources, IS capabilities, IT support for core competencies	Firm performance (operating and market based)	119 Fortune 1000 U.S. Firms (Survey)

Source: Karanja, 2011

3.1.3 Contingency Theory

The key premise of the contingency theory states that better firm performance will be achieved with the congruence among major variables such as the structure, strategy, and environment (Burns & Stalker, 1961; Child, Chung & Davies. (2003); Lawrence & Lorsch, 1967; Schoonhoven, 1981; Venkatraman, 1989). Basically, the link of two variables is dependent on the degree of a third variable.

Under the contingency theory, better effectiveness or higher firm performance may be attained through several ways if the selection of variables is appropriate (Robertson & Chetty, 2000). Accordingly, a third variable could lessen possible misrepresentations and increase the opportunity to establish more comprehensive knowledge (Rosenberg, 1968). This explains the recommendation by most theorists to incorporate the contingency-based approach in any business strategy or corporate theory (Ginsberg & Ventkatraman, 1985).

The application of contingency theory is beneficial in ascertaining the factors influencing the performance of a firm. Particularly, it provides guidelines on the ways to achieve high performance through the notion that dissimilar work settings need different approaches. It also outlines that efficiency is the product of ongoing alignment among a number of contingencies (Bradshaw, 2009). Hence, it is vital for firms to build their own exclusive strategy on the basis of their environment, set of personalities, culture, and history (Brudney & Murray, 1997). The contingency model acknowledges the intelligence of firms to respond environmental turbulence. Johannesson and Palona (2010) point out the role of intelligence strategy to deal with various levels of environmental turbulence to achieve firm performance. Moreover, Valentinov (2012) highlight the linkage between excessive internal systemic complexity and the carrying capacity of the environment.

Contingency strategy points out the adaptive resource-based strategy of firms to respond environmental turbulence. In the emerging economy context, the growing firms are associated with ability to deal with transit system with a corrupt environment (Xheneti & Bartlett, 2012). High perceived environmental uncertainty plays pivotal role in organisation control, but mixed result in small firms (Jokipii, 2010). Respond of managers to the external environment is associated with opportunistic surveillance (Johannesson & Palona, 2010). Sundqvist, Kyläheiko, Kuivalainen, and Cadogan (2012) consider the need of firms to allocate resources carefully and set entrepreneurial strategies to achieve high level of firm performance. With uncertainty, payoffs associated with environmental turbulence need to be taken into account in calibrating resource allocation (Wang & Fang, 2012; Pratono & Mahmood, 2014).

Even though the theory is studied in various researches, it has a common proposition that an organisational outcome is the result of the consequence of a fit or match between two or more factors. In other words, the theory postulates that it is important to find the fit or congruence among major variables such as resources, strategy, and environment in the effort to achieve optimal performance (Burn & Stalker, 1961; Venkatraman & Prescott, 1990). This view is consistent with the view of researchers such as Duncan (1972), Miles, Snow, Meyer, & Coleman, (1978), and Venkatraman (1989). In general, environmental factor is a fundamental contingency variable that is widely acknowledged in the literature. Several theories even argued that the environmental situation causes variations in the strategy or structure of a firm, thus, it is firm-specific. This causes organisations to be unable to employ universal strategy or structure in facing emerging environmental situations (Burns & Stalker, 1961; Venkatraman & Prescott, 1990).

These perspectives highlight the importance of examining the effect of a third variable on the communication between a criterion variable and a predictor variable. Notably, the relationship is influenced by the level of a moderating variable – a third variable – like the environment. Ventkatraman (1989) explained that the extent of the predictor variable differs according to the various levels of the moderating variable. Generally, the moderator is grouped into categorical and characteristic types. The categorical group covers the environmental types, organisation, and stages of product life cycle. Meanwhile, the characteristics group concerns the degree of competitive intensity and the extent of relation to business (Ventkatraman, 1989).

Fiedler (1964) adopted the contingency theory on the outgrowth of system design to suggest that methods which were successfully applied in one situation might not be successful in others. The researcher elaborated that specific contingencies or variables such as industry, technology, environment, and culture would differentiate one organisation from the other. Thus, each firm will arrive at a unique situation. Managers should then learn to identify the salient characteristics of their organisations and try to find solutions that fit those characteristics (Daft, 2006). In other words, the optimal organisation depends on a lot of external and internal limitations. Specifically, Lawrence and Lorsch (1967) pointed out that uncertainties and changes in an environment have a bearing on the development of an organisation's internal features. Higher amount of changes faced by an organisation leads to more differentiation in its structure.

Galbraith (1973) and Işik et al., (2013) outlined the four important concepts of the contingency theory:

a. No specific or universal method on managing an organisation exists.

b. The organisational design and its subsystem have to match the environment.

c. An effective organisation displays a proper fit both with the environment and among its subsystems.

d. The needs of an organisation are better satisfied when the style of management is suitable for both the nature of the work group and the tasks undertaken.

The application of the contingency theory in this study attributes to the prominent role of competitive environment in ensuring the strength of an organisation. This occurs through its role in providing informed strategic decisions that enhance the link among business intelligence systems adoption, information technology infrastructure, and innovation with firm performance. In this light, the dynamic and rapidly changing competitive environment today imposes the urgency for the strategic direction of an organisation to differentiate it from other organisations. By applying the contingency theory, this study upholds the role of competitive environment in making critical information about the firm's surrounding environment available. This contributes to the organisation's adjustments to raise its competitive status within the industry. Without such competitive environment, any attempt to prepare, preserve, and even place the central assets and competencies will remain flawed.

3.2 Hypothesis Development

It gradually shifts to a discussion of the variables identified from earlier studies that lead to the development of hypotheses.

3.2.1 Business Intelligence Systems Adoption and Organisational Performance

In the Western and East Asia countries, business intelligence is being heavily utilised by large and small organisations (Tej Adidam, Banerjee, & Shukla, 2012) and have proven to be an important source of competitive advantage (Mohsin at al., 2015; Smith & Kassou, 2008; Smith, Wright & Pickton, 2010; Wright, 2011). Business intelligence is both a process and a product when an organisation gathers actionable information about the business environment and utilises the intelligence in the decision-making practices to improve the organisation's performance. It is an ongoing process of analysing data and information into intelligence by applying new technologies to develop competitive performance edge (Azma & Mostafapour 2012; Chen, 2012; Fuld, 2010; Zheng at al., 2012).

Business intelligence is generated from the processed business information possessed by employees with highly experienced problem-solving skills and critical thinking. According to the knowledge-based view, the dynamic and ongoing activities related to business intelligence reflect a learning process. By repeating the routines, firms can detect new processes that could deliver more effective and faster performance. Notably, business intelligence assists in the development of tacit knowledge concerning sustainable competitive advantage in the effort to attain extraordinary performance. Oftentimes, this competitive advantage may not be replicated by the competitors (Du Toit, 2003; Hughes, 2005).

The value of intelligence produces by business intelligence (comparatively competitive intelligence) are measured by its accuracy, usability, relevance, readiness and timeliness (Bose & Mahapatra, 2001). Some researchers alleged that competitive intelligence construct was part of business intelligence in their study to evaluate firm performance (Cuyvers et al., 2008; Porter, 1980; Wright et al., 2009). Some other issues specific to business have been studied including intelligence strategy (Johannesson & Palona 2010), critical success factors (Yeoh & Koronios, 2010), and intelligence maturity model (Lahrmann, Marx, Winter, & Wortmann, 2011). Muller, Linders, and Pires (2010) studied business intelligence functions and how service-oriented construct could aid those functions.

Business intelligence develops the competitive advantage of a company and ultimately, ensures superior organisational performance. Wee and Leow (1994) conducted a research on Singaporean companies to examine their business intelligence activities. The results showed a positive connection between the implementation of business intelligence and better organisational effectiveness. Subramanian and Ishak (1998) performed an empirical research depicted that firms equipped with an advanced business intelligence system in place to oversee their environments reported higher profits compared to firms without such a system. A number of researches have revealed the advantages that business intelligence has in terms of firm performance (Badr, Madden, & Wright, 2006; Global Intelligence Alliance, 2004; Jaharuddin, 2012; Jaharuddin, Mohamed, & Sambasivan, 2014; 2015; Jaworski & Wee, 1993; McGonagle & Vella, 1996). In sum, business intelligence leads to improve overall performance of the organisation and optimise of organisational processes and makes the decisions more efficiently (Bike Zadeh & Eskandari, 2009).

In a service sector context, the study concludes that technology, product, market and strategic alliance intelligence practices affect the performance of commercial banks (Ngugi, Gakure, & Mugo, 2012). Business intelligence leads to greater performance and also reduction in costs for banks, with technology intelligence being the highest contributor (Mugo, Wanjau, & Ayodo, 2012). Cappel and Boone (1995), found a positive relationship between business intelligence and financial performance. The study examines the role of business intelligence in corporate strategy and performance and to provide evidence of the relationship between business intelligence and business performance (Jaworski & Wee, 1993; Maune, 2014; Viviers, Saayman, & Muller 2004). Spark (2014) using the association between business intelligence systems and organisational performance virtues is meaningfully correlated.

The knowledge-based view affirms that the knowledge of business intelligence in the form of actionable intelligence that allows firms to develop greater strategy and better performance. The information study literature shows lack of empirical studies when it comes to the impact of business intelligences systems adoption on the firm performance. Hou (2012) evaluated the impact of business intelligence systems adoption on the organisational performance of Taiwan's semiconductor industry and found out that higher levels of business intelligence systems adoption will lead to improved financial performance indirectly through the enhanced internal process, learning and growth and customer performance (non-financial performance. This result provides initial evidence that the adoption of business intelligence systems leads to increased financial performance. Similarly, Elbashir et al., (2008), and Owusu (2017) investigated the benefits organisations achieved by using business intelligence systems by measuring the relationship between business process and organisational performance. The study indicated that business intelligence systems can improve the internal business processes of a firm which in turn can lead to enhanced organisational performance.

While there are many studies that focused on intelligence activities, very few empirical works are available to explain the link between business intelligence and business performance (Owusu, 2017). Thompson (2004) declared that business intelligence systems can improve customer satisfaction, increased revenue and enhanced the business processes of a firm through faster and more accurate reporting. Similarly, Ritacco and Carver (2007), and Moss and Atre (2003,) claimed that business intelligence systems can lower cost, increase revenue, improve customer satisfaction and increase market share. Based on these discussions, the adoption of business intelligence systems will lead to increase in performance.

Therefore, based on the above justification, the study hypothesized that:

H1: There is a positive relationship between business intelligence systems adoption and performance.

3.2.2 Information Technology Infrastructure and Organisational Performance

The performance of the firm is a repeated theme in information technology literature because of its importance to academic scholars and practicing managers (Richard et al., 2009). Information technology has also been shown to lead to intangible firm benefits such as better customer service, superior product quality, improved supplier coordination, smooth materials and information flows, and strategic flexibility (Brynjolfson, 1993; Barua et al., 1995; Karanja, 2011).

Information technology infrastructures include hardware and operating systems, networks and telecommunications technologies, databases, shared services such as electronic data interchange, email, universal file access, videoconferencing and teleconferencing services (Armstrong & Sambamurthy, 1999; Weill & Broadbent, 1998). Most theories in information technology either implicitly or explicitly accentuate performance implications at the business unit or organisational level. In empirical research, many studies in information technology include a construct measuring the organisational performance to evaluate the effectiveness of information technology strategies. On the managerial arena, the many prescriptions offered for improving the performance of firms underscore the importance of this construct.

In RBT, information systems have identified various information technology related resources that serve as potential sources of competitive advantage and performance. The role of information technology this paradigm is based on the view that firms are heterogeneous and thus utilize unique information technology to build strategies that lead to better resource picking and capability building leading to competitive advantage and performance (Aral & Weill, 2007; Karanja, 2011; Oh & Pinsonnealt, 2007; Ray et al., 2004; Santhanam & Hartono, 2003).

In the context of the Spanish economy, Hernando and Núñez (2004) and Sanchez, Rata, Duarte, and Sandulli (2006) also examined the effects of information technology on firm performance. The study by Hernando and Núñez (2004) proved that information technology had a substantial contribution to the growth of productivity and output. Furthermore, a finding by Sanchez et al., (2006) was done also revealed a positive relationship between the usage of information technology and labour productivity. A few researches had indicated a significant positive relationship between information technology and organisational performance (e.g., Alpar & Kim, 1990; Barua et al., 1995; Brynjolfsson & Hitt, 1995; Chen, 2012; Julio, 2008; Lichtenberg, 1987).

Accordingly, the following hypotheses are suggested:

H2: There is a positive relationship between information technology infrastructure and performance.

3.2.3 Business Intelligence Systems Adoption and Innovation

Studies show organisations which have systems for monitoring the activities of their competitors are better able to create competitive advantage through innovation (Michaklisin, 1996; Mohsin et al., 2015). Business intelligence is a strategic tool that allows senior management to improve the organisation's competitive advantage by focusing on the external environment, forecasting the future market direction and innovation (Hussein et al., 2011).

From the knowledge-based view indicate the use of a business intelligence leads to achieving innovation of the organisation. Empirically, there is a positive relationship between business intelligence and innovation in large and small business organisation (Hussein et al., 2011; Mohsin et al., 2015; Tanev & Beiletti, 2008). The innovation literature provides the basis for business intelligence determined innovation in organisation (Koberg, Detienne, & Heppard, 2003; Maghrabi, Oakley, Thambusamy, & Iyer, 2011; Rai & Sambamurthy, 2006). Therefore, the hypothesis

H3: There is a positive relationship between business intelligence systems adoption and innovation.

3.2.4 Information Technology Infrastructure and Innovation

Information technologies enable coordination in innovation projects by making it easier to identify available resources and providing visibility of real-time project data. For example, the effective use of scheduling and time management functionalities makes managers more capable in appointing workers to relevant tasks and enables them to better monitor the performance of workers. By providing real-time information on project status and enabling aggregate project portfolios, the workflow capabilities can help work units become more capable in identifying synergies among their resources and tasks, better synchronizing their activities, and executing their collective activities in parallel (Sethi, Smith, & Park 2001). Therefore, information technology can enhance coordination capability within the innovation process of the firm.

Studies have examined information technology as a medium in which information is well integrated and acts as a good collaboration enabler between various parts of the firm thereby enabling innovation (Pavlou & El Sawy, 2006). Information technology infrastructures are strong drivers of the firms' innovation output (Armstrong & Sambamurthy, 1999; Duncan, 1995; Gordon, 1993; Karanja, 2011; Sethi & King, 1994). Information technology is viewed from RBT as a valuable resource that an organisation uses for its innovation needs. Some studies show that information technology has helped in automating tasks and thereby improving efficiency of many steps in the new product development process (Atuahene-Gima 2005; Zhou et al., 2005). In the context of new product development, Pavlou & El Sawy (2006) explain that the primary differentiator between new product development teams lies in how the team leverages the information technology functionalities and resources. Drawing on the logic that the effective use of information technology functionality can facilitate information-intensive and knowledge-intensive processes, it explains that the information technology competence in firms supports the innovation capabilities (Madhavan & Grover 1998). Hence, innovation can be enhanced by the effective leveraging of information technology functionalities (McGrath & Iansiti 1998; Nambisan 2003). First, information technology support information processing through enhanced communication and increased efficiency of information sharing. Second, the efficiency, scope, and flexibility of innovation capabilities can be enhanced by information technology. Third, information technology facilitates the efficiency of innovation by facilitating rapid and reliable knowledge sharing (Alavi & Leidner 2001), increase knowledge reach and richness (Sambamurthy, Bharadwaj, & Grover, 2003), and enhances their flexibility by enhancing the accessibility and availability of knowledge (Zahra & George, 2002).

Information technology has transformed the core stages of the innovation in a number of ways that were unimaginable (Brynjolfsson & Schrage, 2009; Karanja, 2011). These strategies can be implemented through a number of mechanisms that include informate-up and informate-down information technology infrastructures (Armstrong & Sambamurthy, 1999; Karanja, 2011). Informate up information technology infrastructures provide information to the higher echelons of the firm more easily and efficiently, thus enabling the control and coordination of the ideation processes. On the other hand, informate down information technology infrastructures serve the role of distributing information to the lower levels of the organisations, thus enhancing the information reach while empowering lower cadre employees with relevant knowledge and information.

In addition, innovation is a problem-solving initiative requiring, among others, search processes that involve investments in people, buildings, technologies, and related infrastructures that maintain links with users, suppliers, and other stakeholders in the innovation life cycle (Von Hippel, 1988). By capitalizing on broader and deeper information technology-enabled search strategies, firms can seamlessly adapt to change and, therefore, innovate (Laursen & Salter, 2006). Slack information technology levels lead to inefficient utilization of other firm resources that are necessary and required for innovative activities.

Information technology focus on process improvements are positively related to process innovation in an organisation (Gloet & Terziovski, 2004; Karanja, 2011; Prajogo & Sohal 2003). Usage of information and communication technologies affect innovation performance (Laursen & Foss, 2003). Information technology focus on process improvements are positively related to process innovation in an organisation (Gloet & Terziovski, 2004); Srinivasan, Lilien and Rangaswamy, 2002).

Thus, the following hypothesis is proposed:

H4: There is a positive relationship between information technology infrastructure and innovation.

3.2.5 Innovation and Performance

Innovation is an immediate source of competitive advantage that leads to an improvement in performance (Camisón & Villar-López, 2014). The main reason for firms' engagement in innovation activities is because of the expected positive impact of innovations on firms' success (Lindsay & Vnuk, 2011; Varis & Littunen, 2010). Innovative firms' welcome new ideas, value change, encourage risk-taking and stimulate novel approaches to addressing market needs (Augusto & Coelho, 2009). These firms are more capable of developing new products. Also, managers at such firms tend to devise new ways of resolving business problems because highly innovative firms value change, more likely to improve their operations, production methods and product development processes continually (Tsai & Yang, 2014). As a result of their improvement, these firms may achieve higher performance by enhancing their operational efficiency and effectiveness. In addition, innovative products and processes can facilitate firm survival and growth by creating new demands on the market (Chatzoglou & Chatzoudes,2018; Omri & Hasna, 2015; Turulja & Bajgoric, 2018).

The changing nature of a dynamic environment requires organisations to compete through innovation and adaptability, but also maintain productivity (Brown & Eisenhardt, 1997; Jones & Linderman, 2014; Tushman &Anderson, 1986). There are several prominent strategies adopted by firms to survive and grow in the challenging and fluctuating business environment nowadays. These include the organisation's innovativeness, readiness to manage risks, and the proactive nature (e.g., Al-Swidi & Mahmood, 2011; Barrett & Weinstein, 1998; Covin & Miles, 1999; Covin & Slevin, 1991; Lumpkin & Dess, 1996; Zahra, Nielson, & Bogner, 1999; Zahra & Covin, 1995). Besides, the vast and rapid technological revolution has rendered most traditional approaches to solve customer issues invalid. Hence, new effective methods concerning this matter must be explored (Ramachandran, Devarajan, & Ray, 2006). This leads to the constant requirement for firm's innovativeness in services and products offering. In order to satisfy the customers' expectations, the firm needs to continuously improve to evolve along with the changing needs of the consumers (Dess, Lumpkin, & McGee, 1999).

The RBT argues for innovation as a key driver of firm profitability and survival (Barney, 1991; Hamel, 2000). Lack of or lag in persistent innovativeness has been shown to lead to changes in market dominance from one generation to another (Tellis & Golder 1996, 2001; Karanja, 2011). Lawson and Samson (2001) argued that excellent companies invest and nurture innovation, leading to innovations in new product, services and processes, and superior business performance results. Calantone et al., (2002) also argued that innovation is closely related to organisational performance. Shan and Zhang (2009) noted that sustained competitive advantage can be achieved by enterprises raising independent innovation continually. Wallin, Larsson, Isaksson, & Larsson (2011) argued that innovation is crucial for companies to be competitive on the market over time. Yam et al., (2010) argued that innovation of firms creates opportunities for product innovation and firm success.

Lee and Liu (2008) found that organisational innovation has a positive impact on organisational performance. These arguments lead us to suggest that innovation is likely to have a positive effect on performance (Hsu, Lee, Liu, & Zhang, 2015; Sarkees & Luchs, 2015; Yesil et al., 2013). Jansen, Van Den Bosch, & Volberda (2006) find that in dynamic environments, organisational units that are pursuing exploratory (radical) innovations increase their financial performance.

Innovation has been associated with firm growth (Carden 2005; Karanja, 2011). The positive connection between firm performance and innovation had been proved in a lot of empirical researches (Götz, 1999; Hannan & McDowell, 1990; Koellinger, 2008; Reinganum, 1981; Sutton, 1991). Projogo (2006) examined the effects of process innovation and product innovation towards business performance in terms of market share, profitability, and sales growth between service firms and manufacturing firms in the areas. Furthermore, Deshpande, Farley, and Webster (1993) studied Japanese firms and discovered that innovativeness had a positive impact on organisational success.

Based on the discussion above, the following hypothesis is formulated:

H5: There is a positive relationship between innovation and performance.

3.2.6 Mediating Role of Innovation

In addition to the direct relationship, the relationship between the independent variable and dependent variable can also be examined indirectly through a mediating mechanism. In the information study, it is also important to understand the indirect relationship which explains the process underlying the relationship through mediation. Past studies have highlighted the importance of understanding the mediating mechanism of innovation and performance relationship (Han, Kim, & Srivastava, 1998; Verhess & Meulenberg, 2004; Ramanathan et al., 2010).

Innovation refers to the introduction of changes in a company's managerial practices, processes and structure (Kim & Lui, 2015). The knowledge firms need to carry out organisational innovations that tend to be tacit and complex, so is difficult to transmit (Mol & Birkinshaw, 2006; Ganter & Hecker, 2013). Thus, relations with consumers, competitors and suppliers are key for accessing the knowledge required to implement organisational innovations, as these agents have a wealth of information about developed practices and industrial processes (Al-Laham, Schweizer, & Amburgey, 2010; Kim & Lui, 2015; Mol & Birkinshaw, 2006).

The ability of an organisation to create, gather, disseminate, and leverage knowledge is directly tied to the organisational capacity to sense and respond to innovations leading to competitive advantages and organisational performance (Sambamurthy et al., 2003; Teece, 2006). There are many factors that enable or facilitate the processes of knowledge creation, dissemination, and leverage at the organisational level. Some of these factors include investment strategies such as the information dedicated to innovation. These and other related factors precede innovation. Consequently, this study includes business intelligence systems adoption and information technology infrastructure constructs as antecedents to innovation and shows the interaction with each other and leverage organisational knowledge in ultimately creating organisational performance. This was done to rule out alternative explanations and enhance the reliability of the results because these variables may affect innovation and organisational performance (Dess, Ireland & Hitt, 1990; Gunday et al., 2011; Jarvenpaa, Dickson, & DeSanctis, 1985; Karanja, 2011; Partanen, Chetty, & Rajala, 2014; Ramirez, Parra-Requena, Ruiz-Ortega, & Garcia-Villaverde 2018).

Mundra Gulati, & Vashisth (2011) showed that business intelligence and innovation are the factors that affect the competitive advantage accomplishment and performance. Innovation and business intelligence in knowledge management are the main antecedents for performance (Hana, 2013). In this study, the question of whether business intelligence systems adoption and information technology infrastructure in the context of innovation is considered to be very significant from an organisational performance. Moreover, the motivation to consider innovation as the mediator of the relationship between information technology infrastructure and business intelligence systems adoption on performance is based on the emerging need for research in information technology field, suggesting the importance of innovation in business performance and competitive advantage. Economists and management scholars agree on the role of innovations in generating performance at the firm, industry, or economy level (Brynjolfsson & Schrage, 2009; Porter, 1990; Schumpeter, 1976; Scott, Mark, & Joseph, 2008; Van De Ven, 1986); and firms that are persistent innovators have been demonstrated to appropriate superior performance compared to their competitors (Scott et al., 2008; Karanja, 2011).

Therefore, extending the knowledge-based view and RBT relationships with information such as business intelligence and information technology infrastructure enables the improvement of a company's ability to manage and implement organisational innovation. In summary, mediators play an important role to determine the negative or positive effects of independent variable and dependent variable. Consistent with the present study is focusing on, innovation mediates the relationship between business intelligence systems adoption and information technology infrastructure and performance. There is an evidence in the literature that innovation tend to affect organisational performance. This study considers the literature for each relationship in turn: the link between business intelligence systems adoption and information technology infrastructure on performance. Finally, the study looks at the relationship of these constructs simultaneously and therefore was hypothesized:

H6: Innovation mediates the relationship between business intelligence systems adoption and performance.

H7: Innovation mediates the relationship between information technology infrastructure and performance.

3.2.7 Moderating Role of Competitive Environment

The relationship between independent and dependent variables may also be affected by moderating factors. The role of moderating variables is to strengthen or weaken the relationship between two variables. It also plays a role in changing the direction or magnitude of the predictor-outcome relationship (Baron & Kenny, 1986; MacKinnon, Coxe & Baraldi, 2012). Therefore, a moderating variable is important to be considered in the conceptual framework as a means of understanding the circumstances or types of people affecting the antecedent-outcome link (Hayes & Rockwood, 2017).

This literature on the impact of environmental on firm performance has been extensively studied (e.g., Rugman & Verbeke, 1998, 2000; Sanchez & McKinley, 1998). The RBT of firms (Rugman & Verbeke, 1998) and the stakeholder theory (Orlitzky et al., 2003) have been extensively applied to understand the response of firms to the environment. Organisations are highly complex entities, facing uncertainties and constantly interacting with their environment. Scanning the competitive environment provides information about the underlying economic and competitive forces within an industry which is needed by firms to avoid surprises and identify opportunities to compete against rivals (Du Toit, 2003; Fahey, 1999; Porter, 1980).

In a competitive environment, organisations may also be forced to create new or redesigned processes more frequently as they try to thrive in a rapidly changing environment (Donaldson, 2001). Organisations can commercialise their new services or products by serving new customers and participating in new market segments (Porter, 1980). It is important for firms to be capable of aligning innovativeness in terms of new product commercialisation with the respective environment to achieve higher firm performance (Karanja, 2011). Hence, organisations in a fiercely competitive environment should experience a greater operational benefit than organisations in a less competitive environment (Jones & Linderman, 2014).

Previous study confirmed the moderating influence of environmental turbulence on the relationship between the innovation and organisation performance, taking contingency theory as a theoretical background (Calantone et al., 2002; Turulja & Bajgoric, 2018). Tsai and Yang (2013) showed that innovation has different effects on business performance because of the impact of market turbulence and intensity of competition. Also, Zulu-Chisanga, Boso, Adeola, & Oghazi, (2016) empirically confirmed that environmental turbulence weakens the relationship between new product success and financial performance. Boyne and Meier (2009) support the proposition that environmental turbulence has a negative effect on performance. It is common sense to expect that the larger the unpredictable change, the greater the negative direct impact on organisational results. This is due to the fact that environmental factors create instability that influences firm performance (Anning-Dorson, 2017; Turulja & Bajgoric, 2018). Greater business performance can be achieved by matching innovation to market and technological changes (Turulja & Bajgoric, 2018).

In contrast, the environmental turbulence did not moderate the relationship between proactive approach and firm performance (e.g., Miller & Friesen, 1982; Kraus et al.,2012). Using this argument, the present research used the competitive environment factor as a moderating variable in order to achieve greater clarity and understanding of the underlying factors of innovation and organisational performance. Based on the above justification, this study hypothesized that:

H8: The hostile the competitive environment, the weak the relationship between innovation and performance.

3.3 Hypothesis Summary

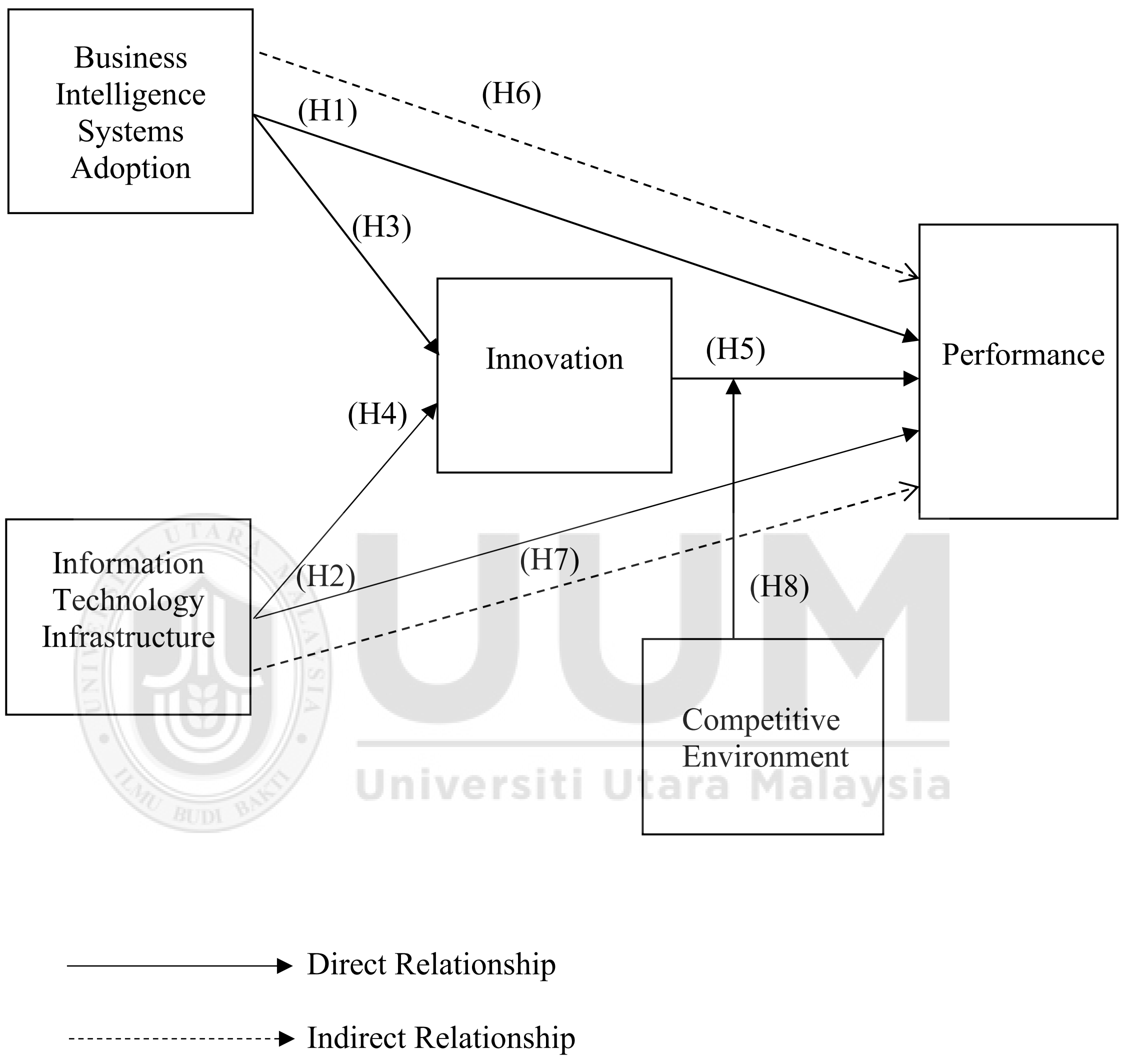
The hypotheses put forward in this thesis are listed in Table 3.2:

Table 3.2:
List of Hypotheses

Hypotheses	Hypotheses Statement
H1	There is a positive relationship between business intelligence systems adoption and performance.
H2	There is a positive relationship between information technology infrastructure and performance.
H3	There is a positive relationship between business intelligence systems adoption and innovation.
H4	There is a positive relationship between information technology infrastructure and innovation.
H5	There is a positive relationship between innovation and performance.
H6	Innovation mediates the relationship between business intelligence systems adoption and performance.
H7	Innovation mediates the relationship between information technology infrastructure and performance.
H8	The hostile the competitive environment, the weak the relationship between innovation and performance.

3.4 Research Conceptual Model

Figure 3.1 below illustrates the direct relationship between two variables the same relationship in the presence of a mediator and moderator. The two independent variables in the current study are business intelligence systems adoption and information technology infrastructure. The dependent variable is performance. The study proposes the mediation effect from innovation between the independent variables and the dependent variable. The moderation effect of competitive environment is between innovation and performance.



Note: The bold line in the figure show the relationship among business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance. The doted lines show the mediation of innovation between business intelligence system adoption, information technology infrastructure, and performance. The moderations effect of bold line of competitive environment between innovation and performance.

Figure 3.1: *Research Conceptual Framework*

The conceptual model of the proposed relationship between business intelligence systems adoption, information technology infrastructure and performance. It is conceptualised that business intelligence systems adoption and information technology infrastructure are positively related to performance. The positive relationship between innovation and performance is also predicted. The model proposes the mediation effect of innovation between business intelligence systems adoption and information technology infrastructure. In addition, the model also proposed the moderation effect of competitive environment between innovation and performance.

In the Figure 3.1 shows the conceptual framework, H1 shows the direct relationship between business intelligence systems adoption and performance. H2 shows the direct relationship between information technology infrastructure and performance. H3 shows the direct relationship between business intelligence systems adoption and innovation. H4 shows the relationship between information technology infrastructure and innovation. H5 shows the relationship between innovation and performance. Based on the conceptualised relationship in H1, H3, and H5, the current study proposes H6 that explains the mediation of innovation between business intelligence systems adoption and performance. Similarly, based on the conceptualised relationship in H2, H4, and H5, the current study proposed H7, that explains the mediation of innovation between information technology infrastructure and performance. Further, the model proposed H8, the moderation effect of competitive environment between innovation and performance.

3.5 Chapter Summary

This chapter outlined the relevant underpinning theories; knowledge-based theory, resource-based theory, and contingency theory. This chapter discussed the hypotheses development and the conceptual model. It also predicted the relationship between independent, dependent, mediating, and moderating variables. The study develops eight hypotheses on the basis of theoretical and empirical arguments. Additionally, the study proposes a conceptual framework based on the hypotheses. The research framework and detailed information of the conceptual framework had also been illustrated in this chapter.

The inclusion of additional variables and relationships to be tested provided a unique perspective for both practitioners and academicians. The framework may potentially provide better understanding and increase the awareness on the connections of business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment with the performance of banks in Malaysia. The following chapter discusses the research methodology of this study.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.0 Introduction

This chapter presents the research methods employed in this study, namely the research paradigm, research framework, research design, research approach, variables and measurement, sampling procedures, pilot study and data collection, data analysis, and summary is placed at the end of the chapter.

4.1 Research Paradigm

Epistemology is about how the world has been viewed in reality (Tobi, 2013). Epistemology is a general set of assumptions about how knowledge about the world is obtained and accepted. Generally, there are several epistemological stances of a research, positivism, realism, interpretivism and pragmatism (Saunders & Lewis, 2012). There are the core assumptions in each of research philosophy, namely: ontology that concerns to the nature of reality, epistemology that deals with the acceptable knowledge and axiology - the role of researcher's value in the research (Pickard, 2013). Positivism advocates the application of methods of natural science to the social science, as the truth needs to be discovered (Tobi, 2013). Whereas interpretivism advocates that social reality is inherently different from natural phenomena for human beings are complex in nature (Robson, 2002). Thus, the researcher needs to be involved with the subject being investigated to fully understand the experiences and events as being defined by the individuals (Cavana, Delahaye, & Sekaran, 2001). An interpretivist tries to uncover the intricate descriptions of how people think, react and feel under certain contextual specific situations, and the subjective measures are normally employed (Cavana et al., 2001). An interpretivist focuses on inductive theory building where qualitative research strategies are employed (Bryman, 2008). This is because the interpretivist believe theory seeks only to explain action and to understand how social order is produced and reproduces (Chua, 1986).

A research paradigm is thought of as a belief system that guides a researcher in investigating study (Guba & Lincoln, 1994). The choice of paradigm is based on the philosophical assumptions made by the researcher (Sobh & Perry, 2006). Researchers can choose from many perspectives for conducting their research. In social science, researchers commonly used the two extremes of paradigm, namely positivism and interpretivism perspectives (Dainty, 2008). Positivism follows a structured method to conduct a study, whereas interpretivism focuses on the context and meaning of research. However, the researcher must clearly understand the three elements of a paradigm, i.e., ontology, epistemology, and methodology, before adopting research perspectives (Goulding, 1999; Guba & Lincoln 1994; Healy & Perry, 2000). Ontology refers to assumptions about reality underlying research, whilst epistemology refers to the relationship between the researcher and reality (Sobh & Perry, 2006). Methodology describes the techniques and procedures used by the researcher to study reality (Healy & Perry, 2000).

Positivists' ontological and epistemological assumptions are as follows: (1) the researcher is separate from the research or reality (Healy & Perry, 2000); (2) the researcher looks at one side of the mirror or seeks to develop true statements (Creswell, 2017; Guba & Lincoln 1994); and (3) being objective is an important aspect of the research (Creswell, 2017). On the other hand, Interpretivists' ontological and epistemological assumptions are as follows: (1) individuals develop their subjective meaning of where they live and what they experience (Creswell, 2017); (2) reality is based on different views and is socially constructed (Tadajewski, 2006); (3) individuals develop a subjective meaning for their experiences (Creswell, 2017) through interactions and discussion; and (4) the researcher is involved in the research to explore new insights (Healy & Perry, 2000).

Positivist believe that the study only authentic knowledge is knowledge that is based on the actual sense of experience, where it can only come from affirmation of theories through a strict scientific method (Tobi, 2013). In other word, positivist infers evidence for a theory through measurement of variables that produce numeric outcomes (Field, 2009). Therefore, this study adopts positivism perspective of research as the research objectives is theory testing rather than theory building.

Furthermore, the choice of either qualitative or quantitative methods is also grounded in ontological and epistemological concerns. For Interpretivists, qualitative methods are more appropriate because they involve research, the researchers, and their experiences (Tadajewski, 2006). On the other hand, for Positivists, quantitative methods are appropriate because they are more concerned with arriving at objective facts that cannot be changed, are based on empirical evidence, and are separate from the researcher (Crotty, 1998; Goles & Hirschheim, 2000). Quantitative methods are also based on objective reality and research findings that can be empirically measured, analysed, and compared with evidence. The most important advantage of the quantitative method is that the results are rigorous, scientific, reliable, and measurable (Decrop 1999; Reason & Rowan, 1981). Another distinguishing point between qualitative and quantitative methods is the role of theory (Bryman, 2008). In this regard, qualitative methods help in generating a new theory, while quantitative methods are more concerned with confirming the application of an existing theory.

Based on the above explanation, the current study uses the positivist approach by adopting clear procedures with rigorous research processes (Atkinson & Hammersley. 1994). This is for the following reasons. Firstly, the approach assumes one ontological reality rather than multiple realities. Secondly, it follows the quantitative approach, which is scientific which requires method to investigate a research and findings are based on empirical evidence (Creswell, 2017). Thirdly, the researcher and the researched are separate in this perspective. Fourthly, the approach is more objective than subjective. Fifthly, the current research uses existing theories and concepts rather than developing new theories, and it develops a theoretical framework by proposing relationships among the variables and conceptualises a model to confirm the predicted relationships. Hence, the quantitative methodology is more appropriate than the qualitative methodology for the objectives of present research.

4.2 Research Framework

A research framework involves a series of choices in rational decision-making and integrates all the information in a logical manner. There are many types of research framework widely used in social science. These frameworks have been discussed by several authors (e.g. Cavana et al., 2001; Cooper & Schindler, 2003; Sekaran 2003). For instance, Cavana et al., (2001) explain the features of selections, choices, and descriptions regarding the phenomena under investigation. Cooper and Schindler (2003) discuss the type of study, data collection methods, time dimension, research environment, and perception of research activity. Sekaran (2003) also explains the elements of research design that includes type of study, type of investigation, extent of researcher interference, unit of analysis, and time horizon. This study used research frameworks introduced by Cavana et al., 2001) because it provides a detailed, thorough, and comprehensive research framework which includes purpose of study, type of investigation, extent of researcher's interference, study setting, time horizon and sampling procedure.

4.3 Research Design

The literature review of the research method has prompted several discussions on the methods or techniques that are more suitable or scientifically sound for the purpose of application in the present study. There are many factors to be some authors have indicated that certain general guidelines exist for assessing the most appropriate method such as the character of the research questions, the information type desired, the availability of resources, the degree of control over the samples, and the ability to manipulate the independent variables (Pervez, 2005; Sekaran, 2000). The aim of this study was organised from the review of literature, directing to a suitable research design and sampling method. The selection method also involves other related factors like monetary issues, time availability, and possibility of access to the information required.

A research design is a framework or a structure that brings together all the research elements. It is the blueprint for the collection, measurement, and data analysis (Cooper & Schindler, 2003). It can be done using quantitative, qualitative, or mixed methods. This study used quantitative research approach based on descriptive and causal research design. Quantitative research features a social reality that constitutes an independent reality and it is relatively constant (Gall, Borg, & Gall, 2003). These phenomena are measured through numerical representations of observations and statistical analysis. Quantitative research study population and sample analyse social reality into variables and generate numerical data represent the social environment (Gall et al., 2003). Quantitative methods are mainly used to test and verify theories or explanations, to identify variables to study, to make a relationship of variables in hypotheses, and employ statistical procedures (Creswell, 2003). Moreover, quantitative research has large features in guaranteeing reliability, validity, and generalisability of results (Brown, 2007).

This study uses survey in the development of the instrument since it is useful in measuring the present situations within firms with a high specificity degree (Lyon, Lumpkin, & Dess, 2000). The survey can also efficiently gather a huge data at relatively low cost, subjected to statistical analysis. Therefore, the research design chosen is suitable for this research because it aims at finding valid and reliable results.

A research design helps the researcher to reach decisions about research, and involves a sequence of decision making choices (Cavana et al., 2001). The following discussion explains the purpose of the study, type of investigation, extent of researcher's interference, study setting, and time horizon for research design undertaken in the current study.

4.3.1 Purpose of the Study

It is significant for a researcher to find out the nature of the subject area to examine the study's hypotheses (Cavana et al., 2001). There are three types of research studies, namely exploratory, descriptive, and hypothesis testing. In an exploratory study, the researcher has less information regarding the research problem, the data available is scant, and the research issue requires deeper understanding and a qualitative approach. Descriptive study describes the characteristics of the variable of interest such as a group of employees. Cavana et al., (2001) describe three reasons for conducting descriptive research. First, descriptive research helps the researcher to understand the response characteristics such as gender, age, and education. Second, descriptive research offers ideas for future research. Third, descriptive research helps make simple conclusions. Hypothesis testing, explains the nature of particular relationships, such as the dependence of variables on the outcome of the hypothesis, and enhances the researcher's understanding regarding the relationships among the variables. Finally, hypothesis testing establishes a cause and effect relationship, and increases methodological rigour.

The current study examines the relationships among business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance. Therefore, hypothesis testing method is more appropriate for this study. Additionally, the study tests the proposed relationships between the variables based on established theories used by previous studies. On the basis of these theories and beliefs, this study hypothesises (i) the relationships between business intelligence systems adoption and performance, between business intelligence systems adoption and innovation, and between innovation and performance; and (ii) the relationships between information technology infrastructure and performance, between information technology infrastructure and innovation, and between innovation and performance; (iii) competitive environment moderated innovation and performance. The current study attempts to test the predicted relationship among these variables.

4.3.2 Type of Investigation

There are three approaches that can be used for investigating a study: clarification, causal, and correlational approaches (Cavana et al., 2001). Clarification focuses on exploratory and descriptive research, while the causal and correlational approaches focus on hypothesis testing. However, the causal approach is necessary to establish cause and effect relationships and to know about the variables causing a problem. On the other hand, the correlational approach requires the researcher to delineate the important variables related to the problem. There are two important concepts in correlational studies, i.e. simultaneousness and concentration of important factors under investigation. In the current study, business intelligence systems adoption and information technology infrastructure are two important constructs that work together to influence performance. Hence, a correlational approach that focuses on hypothesis testing is more appropriate.

4.3.3 Extent of Researcher Interference

In the current study, the researcher does not intervene too much physically in this research, but instead uses a paper and pen approach to collect data. The questionnaires are distributed and collected from the respondents with minimum intervention in the natural study setting.

Respondents fill in the questionnaires without any influence or pressure. As the study intends to examine the behavioural variables in the routine working environment, minimal intervention from the researcher is needed (Sekaran 2003).

4.3.4 Study Setting

There are two types of study setting, contrived and noncontrived. In a contrived study setting, researchers monitor and master the situation and provide us or no effects, spell in a noncontrived setting, the study is borne in a natural context without any restraint. The data gathered in natural settings are more reliable than data gathered in a moderated environment. As discussed earlier, this study is conducted in regular setting or routine environment. Therefore, the results are expected to be more accurate and reliable.

4.3.5 Time Horizon

Considering the time of data collection, studies are classified into longitudinal studies and cross-sectional studies (Cavana, Delahaye & Sekaran, 2001). The longitudinal study establishes a sequence of events under specific conditions. Hence, it is costly and time-consuming, as it measures the activity at several points of time. Sometimes the period consists of many years, and thus, it is difficult to find the same respondents within a regular time interval.

On the other hand, cross-sectional studies measure the experience of respondents at a single point of time (Hawker & Boulton, 2000). In cross-sectional studies, data collection takes less time, is cost effective, and is appropriate for measuring the employees' activities at a given point of time (Rindfleisch, Malter, Ganesan & Moorman 2008). By using self-reported questionnaires, the current study measures cross-sectional data among the bank managers working in Malaysian banking institutions.

4.4 Research Approach

Observation and communication approaches are two types of research method for collecting data. In the observation approach, the researcher is familiar with the study setting and ethically observes and records the respondents' behaviour (Daymon & Holloway 2010). This approach is more appropriate for qualitative studies. However, the problems with this approach are; it is too subjective, difficult to replicate, the results cannot be generalised, and it lacks transparency (Cooper & Schindler 2003). On the other hand, the communication approach requires survey techniques, primary data collection, behavioural questions, and large sample sizes. Moreover, this approach is followed by quantitative studies and can overcome the problems of the observation approach. It solves the problem of subjectivity by measuring reliability, it can be easily replicated, the results can be generalised because of large sample sizes, and it can deal with missing data and report through appropriate procedures. Thus, all these requirements are adopted in the current study as (i) the survey technique is used to test the relationship between the study variables (business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance), (ii) a larger amount of data from bank managers in banking institutions is collected through distributed questionnaires, and (iii) the study measures the activity of the bankers.

Survey techniques are used for obtaining relevant information regarding the study variables. The self-reported questionnaire is the most important instrument used in surveys to collect data (Kerlinger & Lee, 2000). There are two reasons for using self-reported questionnaires. Firstly, the respondents speak for themselves. Secondly, it is the most common instrument used in social science studies because the constructs examined are based on respondents' perceptions. According to Kerlinger and Lee (2000), survey information can be gathered through telephonic surveys, personal visits, and mailed questionnaires. A telephone survey is recommended when respondents are unknown, the mailed approach is used when respondents are widely distributed, and the personal visit approach is used when respondents are known, closely located, and approachable.

In the present study, the questionnaires were distributed through mailed to the bank managers in banking institutions in Malaysia. The advantages of using mail post are that firstly, the researcher can approach the respondents in their respective banks to increase the response rate, and secondly, follow-up through telephone calls and email for second requests can be done for those who do not respond the first time.

4.5 Variables and Measurement

This section discusses the construction of the questionnaire and items, scaling, validation of measurement items, and control of extraneous variables.

4.5.1 Questionnaire Construction

The researcher based the structured questionnaire on the academic literature and interviews with the practitioners. The self-administered questionnaire enabled the data to be gathered as part of the analysis of the banks' variables. The questionnaire was divided into seven parts as presented in Appendix A. Section A was designed to measure the business intelligence systems adoption of the firms whereas Section B measured the firms' information technology infrastructure. Section C, on the other hand, was designed to measure the firms' innovation. Section D measured the firms' competitive environment, and Section E measured the firms' performance. The purpose of Section F was to collect the respondents' and the firms' demographic information.

The questionnaire was divided as follows (see Appendix A):

- Section A: Business Intelligence Systems Adoption
- Section B: Information Technology Infrastructure
- Section C: Innovation

- Section D: Competitive Environment
- Section E: Performance
- Section F: Demographic Profile

4.5.2 Measurement Items

A questionnaire was designed for the constructs based on existing literature and modified to suit the context of the current study. The survey questionnaire developed to measure the constructs was based on previously established scales. In order to make sure of the validity and reliability of the scale items, several lecturers, postgraduate students, and experts in the field of strategic management reviewed the initial draft of the survey. Based on their feedback, no major changes were required except for minor adjustments. For one, the wordings of the demographic questions in the questionnaire were slightly changed to make them simpler and easier to understand. Negatively worded questions were also altered to avoid confusion. This is because in the culture of high-power distance in Malaysian workplace, individuals are more inclined to choose the extreme responses when answering the questionnaire (Johnson, Kulesa, Llc, Cho & Shavitt, 2005).

Data for the present research were gathered using a survey questionnaire research instrument. The survey questionnaire is a logical way to measure intangible constructs such as perceptions and attitudes. The questionnaire can also provide an efficient and versatile data gathering technique (Babbie, 1990). Although the questionnaire may result in data biases due to time of measurement effect and the inability to measure any changes in attitudes, perceptions, or behaviours, it is still the most prevalent data collection method used to measure business performance (Bontis, 2002; Dess & Robinson, 1984; Gupta & Govindarajan, 1984).

After the instruments were evaluated to ensure reliability and validity, few questions were slightly altered to improve their relevance in terms of the research purpose. The questionnaire formulated contained several dimensions, and each consisted sub-items. The seven-point Likert scale was applied, and the respondents were required to indicate the degree to which the items represented the strategy of their bank. A subjective approach was established to measure performance by referring to the works by Gupta and Govindarajan (1984) and Dess and Robinson (1984).

Further details on the measurement items used in this study are provided in the next section. Table 4.1 summarises the measurement items and sources of the variables.

Table 4.1:
Measurement of Variables and Sources

Variables	Measurement of Variables	Sources
Business Intelligence Systems Adoption	• User • System • Task	Burton & Straub's (2006); Brynjolfsson & Hitt, 1996; Elbashir et al., 2008; Fang & Lin, 2006; Ifinedo, 2011; Lonnqvist & Pirttimaki, 2006; Oliveira, Thomas, & Espadanal, 2014; Park & Rim, 2011; Stratopoulos & Dehning, 2000; Thiesse, Staake, Schmitt, & Fleisch, 2011

Information Technology Infrastructure	• Connectivity • Hardware compatibility • Modularity	Bharadwaj (2000); Sircar, Turnbow, & Bordoloi, (2000); Tallon and Pinsonneault (2011), and Tiwana & Konsynski (2010).
Innovation	• Process innovation • Product innovation	Avlonitis et al., (2001); Davenport & Short (1990); Zaltman et al., (1973),
Competitive Environment	• Market turbulence • Technological turbulence	Dess, Lumpkin, & Covin, 1997; Jaworski & Kohli, (1993); Moreno & Casillas, (2008); Pavlou & El Sawy, (2006).
Performance	• Nonfinancial	Elbashir, Collier & Davern, (2008)

4.5.2.1 Measurement of Business Intelligence Systems Adoption

The instrument for business intelligence systems adoption was adapted from Burton and Straub (2006). Each of the constructs, i e., business intelligence systems adoption, user, system, and task adapted from these studies (Brynjolfsson & Hitt, 1996; Elbashir et al., 2008; Fang & Lin, 2006; Ifinedo, 2011; Lonnqvist & Pirttimaki, 2006; Oliveira, Thomas, & Espadanal, 2014; Park & Rim, 2011; Stratopoulos & Dehning, 2000; Thiesse, Staake, Schmitt, & Fleisch, 2011). Thirteen (13) items were used to capture the activities of business intelligence systems adoption (Table 4.2) in the banks, which are as follow:

Table 4.2:
Instrumentation for Business Intelligence Systems Adoption

No.	Business Intelligence Systems Adoption
1	Business intelligence systems to extract values of key performance indicators (KPI).
2	Business intelligence systems to produce operational reporting.
3	Business intelligence systems to produce tactical reporting.
4	Business intelligence systems to produce strategic reporting.

5	Features of business intelligence systems to compare and contrast different aspects of the data acquired.
6	Features of business intelligence systems to test out different assumptions against the data acquired.
7	Features of business intelligence systems to derive insightful conclusions from the data acquired.
8	Features of business intelligence systems to produce regular standardized reports on key performance indicators.
9	Features of business intelligence systems to drill down into the data to understand the root causes of exceptions or issues.
10	Features of business intelligence systems to perform on-the-fly/quick analysis of current and past data acquired.
11	Features of business intelligence systems to perform functions for querying.
12	Features of business intelligence systems for making statistical analysis.
13	Features of business intelligence systems to share insights based on data within the organisation.

4.5.2.2 Measurement of Information Technology Infrastructure

The instrument for information technology infrastructure use was adapted from Bharadwaj (2000); Sircar et al., (2000); Tallon and Pinsonneault (2011), and Tiwana and Konsynski (2010). Items in the measurement of information technology infrastructure (Table 4.3 a-c) are as follow:

Table 4.3a:
Instrumentation for Connectivity

No.	**Connectivity**
1	Our organisation has a high degree of information system interconnectivity (e.g. WAN/LAN).
2	The information systems in my organisation are sufficiently flexible to incorporate electronic connections to external stakeholders.
3	Remote users can seamlessly access centralized data in our information systems.
4	Data is captured and made available accordingly to everyone in the organisation in real time using the on-hand information systems.

Table 4.3b:
Instrumentation for Hardware Compatibility

No.	Hardware Compatibility
1	Our software applications can be easily transported and used across multiple information system platforms.
2	Our information system user interfaces provide transparent access to all platforms and applications.
3	Our organisation offers multiple information system interfaces or entry points (e.g. web access) to external users accordingly.
4	Our organisation makes extensive use of information system middleware to integrate key enterprise applications in business operation.

Table 4.3c:
Instrumentation for Modularity

No.	Modularity
1	The interdependencies of software/hardware components are well-understood in my organisation.
2	Information technology standards are well established at the enterprise-wide level in my organisation.
3	Information technology polices are well established and implemented at the enterprise-wide level in my organisation.
4	Information technology architecture is well established at the enterprise-wide level in my organisation.
5	Compliance procedures for information technology infrastructure are well established at the enterprise-wide level in my organisation.

4.5.2.3 Measurement of Innovation

The instrument for innovation was adapted from Avlonitis et al., (2001), Davenport and Short (1990), and Zaltman et al., (1973), and Items in the measurement of innovation (Table 4.4 a-b) include the following:

Table 4.4a:

Instrumentation for Process Innovation

No.	Process Innovation
1	Developing new processes.
2	Customer information inquiry and consultation.
3	Internal administration and operations.
4	Developing policies and procedures.
5	Changing the organisational structure.
6	Encouraging employees to apply innovative ways to improve work processes.

Table 4.4b:
Instrumentation for Product Innovation

No.	Product Innovation
1	Revised and improved existing products/services.
2	Repackaged existing products/services.
3	Extended the products/services.
4	Created and established new lines of products/services.
5	Introduced different technical characteristics or specifications for different products/services.
6	Offered products/services that are more complex than others which were introduced into the same market.

4.5.2.4 Measurement of Competitive Environment

The instrument for competitive environment was adapted from Dess et al., (1997), Moreno and Casillas (2008), Jaworski and Kohli (1993), and Pavlou and El Sawy (2006). The items in the measurement of competitive environment (Table 4.5 a-b) are as follow:

Table 4.5a:
Instrumentation for Market Turbulence

No.	Market Turbulence
1	The environmental turbulence in our industry is high.
2	New product/service introductions are very frequent in this industry.
3	There are many competitors in this industry.
4	The environment in our industry is continuously changing.
5	Environmental forecasts in our industry are very difficult to predict.
6	In our line of business, customer preference changes quite a lot over time.
7	Our customers tend to look for new products/services all the time.

Table 4.5b:
Instrumentation for Technological Turbulence

No.	Technological Turbulence
1	The technology in our industry is changing rapidly.
2	Technological changes provide big opportunities in our industry.
3	A large number of new products/services have been made possible through technological breakthroughs in our industry.
4	Technological developments in our industry are rather major.
5	The technology in our industry produces better, faster, and cheaper products and services.

4.2.3.5 Measurement of Performance

The instrument for bank performance was adapted from Elbashir et al., (2008). Items in the multidimensional measurement of performance (Table 4.6) are as follow:

Table 4.6:
Instrumentation for Performance

No.	Performance
1	Improved productivity
2	Improved competitive position
3	Increase in sales
4	Increase in profitability
5	Improved overall performance

4.5.3 Scaling

Scaling is used to describe the items or events in a continuum to distinguish individuals' responses from one another (Sekaran 2003; Zikmund 2003). These scales are divided into four types, namely nominal, ordinal, interval, and ratio scales (Sekaran 2003). Of these scales, interval and ratio scales increase the degree of sophistication. Using these scales increases the degree of information, and answers are clear and complete. This study uses an interval scale as it allows quantitative analysis of the information collected from respondents to be performed, which is not possible through ordinal and nominal scales (Sekaran 2003). Additionally, the interval scale can group the respondents according to their definite sets. This scale also measures the magnitude of differences in sets or groups and gives information about the involvement of individuals in certain behaviours such as sharing knowledge. In addition, this type of scale is commonly used in behavioural research (Zikmund 2003). Hence, this study employed a Likert-type interval scale for business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance.

There is no conclusive suggestion for the optimal numbers in a Likert scale. However, it is suggested that the range of possible responses for a commonly used scale should vary from 5 to7 points, which produces more instances of high scores as compared to a 10-point Likert scale (Dawes 2008). In deciding the appropriate Likert scale, it is also suggested to use five to seven-point Likert scales to focus on behavioural studies (Lehmann & Hulbert, 1972).

Following Churchill's (1979) suggestion, the present scales were applied, altered, and extended. Apart from the profile of the respondents and the section for usage level, which had categorical nature, the Likert scale was applied in all questions. The items were measured on a seven-point Likert Scale with end points "1 = Strongly Disagree" and "7 = Strongly Agree" and for performance measure was "1 = Extremely Low" and "7 = Extremely High". A questionnaire is attached in Appendix A. Table 4.7 presents the seven-point Likert scale which was applied in the questionnaire to elicit answers from the respondents.

Table 4.7:
Seven-Point Likert Scale

1 Strongly Disagree	2 Disagree	3 Slightly Disagree	3 Neither Disagree nor Agree	5 Slightly Agree	6 Agree	7 Strongly Agree
1 Extremely Low	2 Low	3 Slightly Low	4 Neither Low nor High	5 Slightly High	6 High	7 Extremely High

4.6 Sampling Procedures

Sampling is the process of selecting sufficient numbers of respondents from a target population to generalize the characteristics of the sample to the whole population (Cavana et al., 2001). There are two reasons for selecting a sample rather than investigating the whole population in this study. First, it is impossible to collect and examine every element in the population. Second, the sampling is cost effective, generates more reliable results, and involves fewer errors while collecting data (Cavana et al., 2001).

4.6.1 Population

Population refers to the whole group of people working in an organisation or set of organisations that the researcher intends to investigate (Cavana et al., 2001). The specific organisation chosen is the banking institutions, which has been identified as one of the most important sectors to face directive's attention (Davis, 1989; Gibbons, 1992). Banking institutions were chosen to have shown ample improvement in terms of cycle time, cost, and time efficiency (Vukšić et al., 2013). Increased financial services integration within the community has become imperative because of the increased internalisation of the world's financial system and the realisation that the creation of a stable and competitive financial arena was a precondition for the achievement of a true internal market (Servais, 1988; Gibbons, 1992). Banking institutions have the following functions: to permit or facilitate payments, to provide agency functions in changing finance terms (i.e. payment dates, interest rates), and to hold or manage financial assets on behalf of third parties. The Malaysian banking institutions included in this study were mainly Islamic banks, commercial banks, and DFIs. Table 4.8 shows the number of banks in licensed banking institutions in Malaysia.

Table 4.8:
Selected Banking Institutions under Bank Negara Malaysia

Selected Banking Institutions	No. of Banking Institutions
Islamic Banks	16
Commercial Banks	27
Development Financial Institutions (DFIs)	4

Source: Bank Negara Malaysia (2017)

4.6.2 Sample Frame

This study adopted the quantitative approach through a survey method. Therefore, in this study, the evaluation was accomplished through the subjective perception based measures at the organizational level. The use of the executive's perceptions was considered appropriate because most of the data required to measure the performance are intangible or qualitative in nature and would be difficult, if not impossible, to collect objectively. The perception-based measurement provides opportunities for insights into these intangible quality-related business processes benefits (Elbashir et al., 2008). Elbashir et al., (2008), further declared that perceptual measures have been widely used in almost all the behaviourally oriented business and management disciplines whereby senior executives' and middle managers' perceptions are found to be a good proxy for organisational performance impact (Zhuang & Lederer, 2003). Previous studies have reported about high convergence and/or relationship between performance measures and perceptual data collected from senior executives and lower level managers (Elbashir et al., 2008; Ray et al., 2004; Owusu, 2017) and hence it used in this study.

Focusing on banks, the identified unit of analysis is organisation was therefore branch managers of locally incorporated Islamic, commercial, and development financial institutions in Malaysia. Local and foreign banks were taken as these banks had extensive branch networks. The sampling frame was obtained from the Bank Negara Malaysia (BNM) and the respective bank website. Since key informants were branch managers, the selection of the banking institutions made the sample homogeneous. Branch managers were chosen due to their responsibility for the strategic business unit level.

In addition, they incorporate the most knowledgeable individuals in the banks, accruing from their involvement in decision-making, familiarity with company policies, schemes, and perceptions of external business surroundings (Brazeal, 1993; Weaver & Leiteritz, 2002). Hence, they were the best when describing the variety of banks' organisational characteristics (Dwairi, 2004; Mahmood & Abd Wahid, 2012). Additionally, this research focused more on organisational capabilities which connected nearer to branch management rather than top management. This study also aimed to measure those responsible for the implementation of a strategy. Therefore, gathering data from the branch managers would well support the focus of this study. Branch managers from the sampling frame were sent with the questionnaire.

The ever-increasing need for a representative statistical sample in empirical research has created the need for an efficient method of determining sample size. To direct the existing gap, a board to determine the sample size of a given population for easy extension is provided. Based on the population and sample size tables by Krejcie and Morgan (1970), the appropriate sample size for the study's finite population was determined to be 384 respondents in Table 4.9.

Table 4.9:
Table for Determining Sample Size for a Finite Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Formula for determining sample size

$$s = X^2NP(1-P) \div d^2(N-1) + X^2P(1-P)$$

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

Source: Krejcie & Morgan, 1970

4.6.3 Sampling Technique

As stated by Albright, Winston and Zappe (2003), instead of taking samples from the whole population, selecting separate simple random sample from each stratum is more relevant. Therefore, the stratified sampling technique was employed. Stratified sampling method was chosen because stratification could ensure: i) homogeneity within a group – in the context of this study, the banking institutions in a financial sector and, ii) heterogeneity across group such as different types of banks (Cavana et al., 2001; Hair, 2007). This sampling technique has an advantage which is considered the most efficient amongst all probability designs, is that the appropriately defined strata results in more accurate population estimates. Data collection was done through mailed questionnaire with proportionate stratified and purposive sampling techniques from bank managers. Details on applying the sample as a foundation for the proportionate stratified sampling based on

Microsoft Excel calculations and tables by Krejcie and Morgan (1970), as the population (N) for this study is 3422 and required sample size (S) is 346 are outlined in Table 4.10.

Table 4.10.
Proportionate Stratified Sampling of the Respondents

No.	**Bank**	**Total Branch (A)**	**% of Total Population (B)**	**Required Sample (C)**	**Actual Required Sample (D)**	**Questionnaire Distributed (E@Dx3)**
Islamic Banks						
1	Affin Islamic Bank Berhad	10	10/3422 =0.29	0.29/100x346 =1.01	1.01	3
2	Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	23	23/3422 =0.67	0.67/100x346 =2.33	2.33	7
3	Alliance Islamic Bank Berhad*	1	1/3422 =0.03	0.03/100x346 =0.10	1.00	1
4	AmBank Islamic Berhad*	1	1/3422 =0.03	0.03/100x346 =0.10	1.00	1
5	Asian Finance Bank Berhad	2	2/3422 =0.06	0.06/100x346 =0.20	1.00	1
6	Bank Islam Malaysia Berhad	142	142/3422 =4.15	4.15/100x346 =14.36	14.36	43
7	Bank Muamalat Malaysia Berhad	64	62/3422 =1.87	1.87/100x346 =6.47	6.47	19
8	CIMB Islamic Bank Berhad*	1	1/3422 =1.87	1.87/100x346 =0.10	1.00	1
9	HSBC Amanah Malaysia Berhad	8	8/3422 =0.23	0.23/100x346 =0.81	0.81	2
10	Hong Leong Islamic Bank Berhad	8	8/3422 =0.23	0.23/100x346 =0.81	0.81	2
11	Kuwait Finance House (Malaysia) Berhad	17	17/3422 =0.50	0.50/100x346 =1.72	1.72	5
12	Maybank Islamic Berhad*	1	1/3422 =0.03	0.03/100x346 =0.10	1.00	1

13	OCBC Al-Amin Bank Berhad	11	11/3422 =0.32	0.32/100x346 =1.11	1.11	3
14	Public Islamic Bank Berhad*	1	1/3422 =0.03	0.03/100x346 =0.10	1.00	1
15	RHB Islamic Bank Berhad	15	15/3422 =0.44	0.44/100x346 =1.52	1.52	5
16	Standard Chartered Saadiq Berhad	7	7/3422 =0.20	0.20/100x346 =0.71	0.71	2
	Total	312	312/3422 =9.12	9.12/100x346 =31.55	36.84	99
	*Similar with Commercial Banks					
Commercial Banks						
1	Affin Bank Berhad	102	102/3422 =2.98	2.98/100x346 =10.31	10.31	27
2	Alliance Bank Malaysia Berhad	88	88/3422 =2.57	2.57/100x346 =8.90	8.90	72
3	AmBank (M) Berhad	238	238/3422 =6.95	6.95/100x346 =24.06	24.06	2
4	BNP Paribas Malaysia Berhad	6	6/3422 =0.18	0.18/100x346 =0.61	0.61	2
5	Bangkok Bank Berhad	6	6/3422 =0.18	0.18/100x346 =0.61	0.61	1
6	Bank of America Malaysia Berhad	2	2/3422 =0.06	0.06/100x346 =0.20	1.00	2
7	Bank of China (Malaysia) Berhad	5	5/3422 =0.15	0.15/100x346 =0.51	0.51	1
8	Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	2	2/3422 =0.06	0.06/100x346 =0.20	1.00	89
9	CIMB Bank Berhad	294	294/3422 =8.59	8.59/100x346 =29.73	29.73	3
10	Citibank Berhad	11	11/3422 =0.32	0.32/100x346 =1.11	1.11	1
11	Deutsche Bank (Malaysia) Berhad	4	4/3422 =0.12	0.12/100x346 =0.40	1.00	23
12	HSBC Bank Malaysia Berhad	76	76/3422 =2.22	2.22/100x346 =7.68	7.68	91
13	Hong Leong Bank Berhad	299	299/3422 =8.74	8.74/100x346 =30.23	30.23	1

14	India International Bank (Malaysia) Berhad	1	1/3422 =0.03	0.03/100x346 =0.10	1.00	2
15	Industrial and Commercial Bank of China (Malaysia) Berhad	6	6/3422 =0.18	0.18/100x346 =0.61	0.61	1
16	J.P. Morgan Chase Bank Berhad	1	1/3422 =0.03	0.03/100x346 =0.10	1.00	114
17	Malayan Banking Berhad	375	375/3422 =10.96	10.96/100x346 =37.92	37.92	1
18	Mizuho Bank (Malaysia) Berhad	3	3/3422 =0.09	0.09/100x346 =0.30	1.00	1
19	National Bank of Abu Dhabi Malaysia Berhad	1	/3422 =0.03	0.03/100x346 =0.10	1.00	10
20	OCBC Bank (Malaysia) Berhad	33	33/3422 =0.96	0.96/100x346 =3.34	3.34	81
21	Public Bank Berhad	266	266/3422 =7.77	7.77/100x346 =26.90	26.90	60
22	RHB Bank Berhad	199	199/3422 =5.82	5.82/100x346 =20.12	20.12	11
23	Standard Chartered Bank Malaysia Berhad	35	35/3422 =1.02	1.02/100x346 =3.54	3.54	1
24	Sumitomo Mitsui Banking Corporation Malaysia Berhad	4	4/3422 =0.12	0.12/100x346 =0.40	1.00	2
25	The Bank of Nova Scotia Berhad	5	5/3422 =0.15	0.15/100x346 =0.51	0.51	1
26	The Royal Bank of Scotland Berhad	2	2/3422 =0.06	0.06/100x346 =0.20	1.00	14
27	United Overseas Bank (Malaysia) Bhd.	46	46/3422 =1.34	1.34/100x346 =4.65	4.65	643
	Total	2110	61.66	213.34	220.32	643
Development Financial Institutions (DFIs)						
1	Bank Perusahaan Kecil & Sederhana Malaysia Berhad (SME Bank)	35	35/3422 =1.02	1.02/100x346 =3.54	3.54	11
2	Bank Kerjasama Rakyat Malaysia Berhad	364	364/3422 =0.64	0.64/100x346 =36.80	36.80	110

3	Bank Simpanan Nasional	400	400/3422 =11.69	11.69/100x346 =40.44	40.44	121
4	Bank Pertanian Malaysia Berhad (Agrobank)	201	201/3422 =5.87	5.87/100x346 =20.32	20.32	61
	Total	1000	29.22	101.11	101.11	303
	Grand Total	3422	100	346	358	1045

The strategic management researches have witnessed frequent implementation of this method which is described to require minimal researcher intervention. Furthermore, it assists to avoid unavailability of records and is beneficial to develop uniform data from various respondents (Sutton, 2000). Some other significant benefit of this approach is that it is fairly cost efficient (Jogaratnam & Tse, 2006). These advantages motivated the researcher to choose this method for the current research in order to economically gather data within the time frame presented. Nonetheless, similar to other methods, there are several limitations for this method. Notably, Malaysian organisations had demonstrated low response rate. Therefore, the researcher was distributed three times actual required sample questionnaires to solve this problem.

4.6.4 Assessment of Measures

With increasing reliance being placed on the results of the study, there is a need for the results of this study to be reliable and valid in the interests of clarity and consistency. The key to the effective use of the survey methodology undertaken for this research is its ability to provide good theoretical estimates of the phenomenon being measured. Having completed the design of the instrument, the next step is to examine the extent to which it could be considered reliable and valid in measuring the domain that it sets out to examine. For conducting a research study, it is essential to check the accuracy of measured concepts with the actual concept set forth by the study before starting data collection (Sekaran, 2003). The use of better measurement certifies the accuracy of results. Pretesting of the measurement questionnaire is used to improve the quality of the draft in terms of measuring the validity and reliability of the research constructs.

The developed questionnaire was also evaluated for its validity and reliability. The evaluation of validity is done through content validity and construct validity. Content validity was done to check for the wording and made various suggestions which were incorporated to enhance the questions. Content validity is a subjective assessment and is based on personal judgment; a questionnaire is verified and determined based on the judgments of the experts. Construct validity is divided into convergent and discriminant validity. Reliability is significant to determine the degree of internal consistency in measuring the instrument (questionnaire). It will determine the stability of the instrument in yielding similar outcomes for each repeated application.

4.6.4.1 Validity of the Research

Validity refers to the degree to which the instrument (questionnaire) measures the items that it is supposed to measure. Validity is described as the accuracy of the instrument. Huck and Comer (2004) defined content validity as the extent to which a variety of items collectively measure what they set to cover. It is judgmental in nature (Kerlinger & Lee, 2000) and it is normally detected through experts' comparison on the instrument's domain and the content to be measured (Churchill, 1979; Huck & Comer, 2004). In this research, content validity was ensured as several items were taken from prior studies. The experts of bank managers from the industry and the academia were asked to review the official document in order to ensure content validity. The content validity of the instrument in this research was tested in terms of readability and clarity by the experts in banking institutions. Through experts from industry and academics checked for the wording and made various suggestions which were incorporated to enhance the questions. The feedbacks required were on language, readability, redundancy of items, and clarity. They provided feedback to confirm that the items had covered the required dimensions studied adequately or not. In the context of this study, experts were sought and asked to assess the content, phrasing and the ranking of the questions, in addition to the format of the instrument. Finally, modifications to the document was subsequently done according to their feedback and the questionnaire was revised in order to improve its content validity.

In the validity of the research, construct validity was also discussed. Construct validity is further divided into convergent and discriminant validity (Cavana et al., 2001). Convergent validity measures the item of the same construct are related with each other. It can be measured through observed factor loading, Average Variance Method (AVM), Cronbach's Alpha, and composite reliability. Discriminant validity follows the criteria that a latent variable explains variance better than another latent variable and explains that the indicators are not related to each other. It is assessed through cross loadings and Fornell-Larcker criterion.

4.6.4.2 Reliability of the Data

Reliability test needs to be performed to determine the instrument's internal consistency. Consistency represents the extent to which certain group of items measures a concept (Cavana et al., 2001). As a reliability coefficient, Cronbach's alpha illustrates how well the items in a set have positive correlation with one another (Sekaran, 2003). The value is calculated via average intercorrelation among the items that measure the concept (Cavana et al., 2001). This research adopted Cronbach's alpha because it is versatile when handling constant variables (Huck & Comer, 2004).

The values of Cronbach's alpha represent the instrument's reliability. The reliability of the research instrument was determined by establishing the reliability measurement to test the stability and consistency of the instrument. According to Cavana et al., (2001), this value can range from 0 to 1. Nunnally (1967) considered that a modest range of reliability between 0.5 and 0.6 would suffice. In general, value of 0.8 or more for alpha coefficient is considered good (Bryman & Cramer, 1990). Furthermore, Nunnally and Bernstein (1994) suggested for the minimum level of reliability to be set at 0.70. (Pallant, 2005) also recommended for ideal Cronbach's coefficient value to be more than 0.70. The value of 0.8 or more for Alpha is deemed to be good, whereas 0.7 is the minimum satisfactory value.

4.6.5 Control of Extraneous Variables

An extraneous variable is defined as any variable that can influence the study results, but is not of substantive interest in the study (Reynolds, Simintiras & Diamantopoulos, 2003). Extraneous variables might affect the research variables of the study (Kelly, 2011), though, are not the actual focus of the research. Control of extraneous variables minimises and nullifies the effect of extraneous variables (Reynolds et al., 2003). These extraneous variables control the extraneous factors such as demographic information, organisational and psychographic variables (Kelly 2011; Reynolds et al., 2003). This is particularly important in an experimental study, as the manipulation of independent variables and its effect on dependent variables requires extraneous variables to control the extraneous factors. In addition, the control of extraneous variables is important in comparative studies (Reynolds et al., 2003). However, these variables are undesirable in a non-contrived environment because it makes the model more complex, adds error to the findings, and also weakens the internal validity (Kalton, 1968; Reynolds et al., 2003). Moreover, the data gathered in a non-contrived setting is more reliable than data gathered in a controlled environment (Kalton, 1968). Therefore, the current study does not consider extraneous variables because firstly, the study is not a comparative study, without dividing into sub-groups. Secondly, the current study is conducted in a non-controlled environment and with minimum intervention from the researcher. Thirdly, the objective of the study is to examine the relationship and not the effect of extraneous variables.

4.7 Pilot Study and Data Collection

The procedure for conducting a pilot study and the main analysis for the current study are discussed in detail in this section.

4.7.1 Pilot Study

The questionnaire used in the main study has to be piloted with a sufficient sample from the target population (Cavana et al., 2001). This assists the researcher to infer the information collection and distribution process and mitigates the force of non-response bias and the researcher's bias during data collection. The main objectives of this pilot study were: (a) to check the clarity and comprehensibility of the questionnaire items, and (b) to access the reliability of the measures. Kinnear and Taylor (1996) suggested that the appropriate number of questionnaires for a pilot study should range from 15 to 30.

Following the questionnaire formulation, a pilot study was conducted to assess its suitability for a large-scale survey. A pilot study may be defined as any small-scale exploratory technique that uses sampling, but does not apply rigorous standards (Vogt, 1999; Grooms, 2001). A pilot study is performed to generate an initial approximation of the areas being considered as a means of planning a larger scale study. It generally uses a small number of observations to gain information about the overall population (Denzin & Lincoln, 1998).

A pilot study was administered to a selected group of bank managers based on convenience sampling prior to the commencement of the actual research. The purposes of the pilot study were to anticipate the responses of the prospective respondents on the format, content, and length of the questionnaire; to request critical comment regarding the scales' clarity from the participants; and to enhance the validity and reliability of the measurement scales (Cooper & Schindler, 2006; Good & Harding, 2003; Robson, 2002). Furthermore, the pilot study could enhance the face validity of the questionnaire and improve the scales' psychometric properties. The execution of the pilot study was parallel with Nunally's (1978) suggestion to perform a subjective assessment on a survey instrument. The researcher claimed that this step is vital to produce understandable questions and ensure that the scale items represented the studied underlying constructs.

Therefore, the present study used convenience sampling without any restriction on sub-groups (Cavana et al., 2001) and collected data without prior information about the sample.

The current study used convenience sampling to collect data based on three reasons: first, the study did not divide the bank managers into further subcategories. Second, the researcher did not get the demographic information or prior experience about the sample. Third, the researcher could send questionnaires to the respondents based on their availability, willingness, and convenience. According to Cavana et al., (2001), convenience sampling is the best data collection technique for quick and efficient information gathering.

A sample representative population was selected for the pilot study to determine whether the respondents understood the questions, to seek pointers for perfecting the questionnaire, and to ascertain the time required by the respondents to answer the survey completely. This therefore enhanced the validity and reliability of the questionnaire distributed during the research. A convenience sampling of 40 banking institutions in Selangor and Negeri Sembilan area was chosen for this pilot study involving the same number of managers who were identified and contacted to participate in the pilot-test. The branches represented all types of banks in Malaysia. The survey questionnaires were hand-delivered to the selected branch managers and picked up a week later. Once all the completed and usable questionnaires were obtained, the pilot study was completed.

The study tested the reliability of the measures in order to establish the degree to which the measures were free from error or free from bias (Sekaran, 2003), to assess the reliability of the attributes, and to ensure that the wordings of the questionnaire are clear (Akbaba, 2006).

This study also tested the internal consistency or reliability through Cronbach's Alpha, which indicates the similarity of items with the measure of concept under interest (Cavana et al., (2001). The accepted Cronbach's alpha for social science research is above 0.70 (Nunnally, 1978).

In addition, a reliability test was performed to test the instruments' internal consistency. The test was done on the completed questionnaires obtained during the pilot-test. The result of the pilot study of the usable 32 responses revealed that the instrumentation to measure the variables in this study possessed excellent reliability with coefficient alpha of above 0.60, exceeding the acceptable reason as suggested by Hair, Anderson, Tatham, and Black (2005), Nunnally and Bernstein (1994), and Nunally (1978). In this study, all the constructs are reliable of tested variables exceeded 0.6 (ranging from 0.899 to 0.977), not a single item was deleted, in line with the suggestion by Pallant (2007) and Hair, Ringle and Sarstedt (2011). Table 4.11 presents the Cronbach's alpha of each variable for the current study.

Table 4.11:
Reliability Coefficients for Variables (n-32)

Variables	**Items**	**Cronbach's Alpha**
Business Intelligence Systems Adoption	13	0.968
Information Technology Infrastructure	13	0.946
Innovation	12	0.977
Competitive Environment	12	0.953
Performance	5	0.899

4.7.2 Actual Data Collection

The current study employed a self-administered postage survey questionnaire technique to collect data from the target population comprising banks manager in the Malaysian banking institutions. To increase the response rate and attention of the respondents and to minimize the error, the researcher has tried her best to consider and use the appropriate and suitable format, contents, and instructions of the questionnaire. On the cover page of the questionnaire, the researcher assured the confidentiality and use of data only for academic purposes.

Before collecting data, Universiti Utara Malaysia (UUM)-Othman Yeop Abdullah Graduate School of Business had issued a letter, which certified the title and purpose of the study and a request to give cooperation to the researcher during the data collection (see Appendix B). The researcher posted 1045 questionnaires (refer Table 4.10) and collected 191 questionnaires. Data was collected over a span of almost five months, from the early of March 2017 to the middle of July 2017.

4.7.3 Data Cleaning and Preparation

The cleaning and preparation of data is an important process to find and eliminate response errors, ambiguities, and incomplete data. It includes checking and reviewing the questionnaire for accuracy and completeness, assigning a code to each item, and entering the data for analysis (Kinnear & Taylor, 1996). First, the researcher manually reviewed all questionnaires and separated the invalid questionnaires such as one or more sections of the questionnaire were incomplete or unanswered and return a blank form. Altogether 14 invalid questionnaires were removed for further analysis. After manual screening, the data was entered into Statistical Package for Social Sciences (SPSS) version 20.0 for computer screening, cleaning, and dealing with other issues such as outliers, normality, and multi-collinearity.

4.8 Data Analysis

The study data were analysed using two statistical techniques. First, preliminary analysis was conducted using the SPSS version 20.0. Second, the main data analysis was conducted using Partial Least Square-Structural Equation Modelling (PLS-SEM) version 3.0. In the first stage, the data was analysed to check for missing values, outliers, normality, and multi-collinearity. In the second stage, the main analysis was conducted using the PLS-SEM path modelling technique to test the measurement and structural models.

4.8.1 Preliminary Analysis

The statistical techniques chosen must be appropriate not only for accomplishing the research objectives but also for the particular type of data being analysed (Hair, Anderson, Tatham, & Black (1992). In this study, the completed questionnaires were returned by the respondents and were screened to eliminate those forms that were improperly filled out. In the initial stage, the SPSS 20 was adopted. The SPSS 20 generated descriptive analyses for demographic information and variables like mean, standard deviation and Pearson correlation. In addition, it was also used to assess the missing data. In other words, SPSS facilitated the extensive manipulation and transformation of data collected and included a range of statistical analysis techniques that contributed to a meaningful research result (Coakes & Steed, 2007). The objective of the data analysis is to ensure completeness, consistency, and reliability in the data (Zikmund, 2000).

The process of screening data is performed before further statistical analysis to explore the features of the data in an effort to affirm the accuracy of data, missing data, pattern of missing information, extreme response, appropriateness of numerical codes for each variable under study, and whether the data fit the statistical assumptions (Tabachnick & Fidell, 2007). In this process, care should be taken because incorrectly entered data may deviate the distribution of variables from normal (Coakes & Steed, 2003) and therefore developing a distorted correlation (Tabachnick & Fidell, 2007). Therefore, all data in this work were subject to outliers, normality, linearity, homosdesticity, and multicollinearity evaluations (Hair, Black, Babin, & Anderson, 2010; Pallant, 2007).

Preliminary analysis is important to ensure the validity and usability of data for acceptable findings. Moreover, preliminary analysis is required to meet the general assumption of multi-collinearity issues particularly when using SEM analysis. There are four steps involved in preliminary analysis: (a) to identify and deal with the missing values, (b) to check the univariate and multivariate outliers, (c) to check the normality of the data, and (d) to investigate multi-collinearity.

In data analysis, data screening is crucial prior to PLS-SEM modelling. It involves dealing with missing values, detecting of outliers, and checking the accuracy of the data input (Tabachnick & Fidell, 2007). It is done to ascertain that the data entry was correct, and the variables have normal distribution prior to going forward with the following level. In the event that the distribution of variables deviates substantially, the results validity may be negatively affected (Coakes & Steed, 2007). Nevertheless, non-parametric techniques including PLS does not require data that are normally distributed (Chin & Newsted, 1999). In the consecutive section, the processes for data screening involving the missing value analysis, detection of outliers, and normality are described.

Data screening is a process to confirm the accuracy of the data keyed would not produce distorted correlation (Tabachnick & Fidell, 2007). The data screening process is conducted through the detection of missing value analysis, detection of outliers, and normality:

a. Missing Value

Missing value refers to information that is not available in a returned questionnaire where all other information is available. It can have an impact on the validity of the findings. Missing value can be replaced by calculating the mean and then put it back into the data or by simply deleting the questionnaires with missing values.

b. Detection of Outliers

Outliers refer to the observations that exist as unique characteristics identifiable as distinctly different compared to all other observations. Outliers can be detected using histograms, box plots, Mahalanobis distance or z-score.

c. Normality

Normality is crucial for multivariate analysis. It assumes that all linear combinations of variables and each variable have a normal distribution. Normality can be evaluated through either graphical or statistical methods. The statistical components are kurtosis and skewness, while the graphical method is Q-Q plots.

4.8.1.1 Missing Value

The first step in preliminary analysis is to identify the nature and amount of missing data. This is important to satisfy the requirements of statistical tests, for example, SEM which requires a reasonable quantity of complete data to estimate parameters. In addition, missing values cannot be ignored because these can bias the estimation by reducing or exaggerating the statistical power that can lead to invalid conclusions (Acock, 2005; Tabachnick & Fidell, 2013). Additionally, Tabachnick and Fidell (2007) indicate that if missing values constitute five percent or less in a random pattern from the overall data set, nearly any procedure to address missing values will yield comparable outcomes.

The next action was to replace the missing values using an appropriate approach. Among the approaches, expectation maximization is the suggested approach for smaller percentages of missing value a number instead of removing a number of cases from the usable data that can influence the significance of the results (Tabachnick & Fidell, 2013). Expectation maximization can be implemented using SPSS where it replaces missing values with a set of plausible values (impute new data) (Acock, 2005). This approach provides valuable information on patterns of missing values and difference in cases with and without missing values.

Standard deviations and means were applied to evaluate the data input's accuracy. The credible 7-point Likert scale was used to measure all answer. It must be noted that it is common for every survey to have missing values in its data sets (Coakes & Steed, 2007; Hair, Anderson, Tatham, & Black, 2005). If a respondent misses answering one or more questions, this will result in missing data. Missing data may be prevented by adopting an instrument that is well-defined and unequivocal. Nevertheless, this can be overlooked if the value of missing data is smaller than 5 % for a particular variable, and the data passing is not systematic and only accidental (Kline, 2005).

It can be ignored and any imputation techniques available can be employed to handle missing data (Hair et al., 2010). Cohen and Cohen (1983) opined that a value of up to 10 % for missing data is considered to be fairly small and is unlikely to adversely affect the interpretation of the findings. Kline (2005) added that less than 5 % missing data for a single variable is negligible. For missing data value of less than 5 %, mean substitution is the easiest method to solve the missing data issue (Tabachnick & Fidell, 2007). This method is used extensively as its basis is valid responses, making it the most ideal substitution for missing data (Hair et al., 2005).

Missing value analysis (MVA) performed for this study indicates that the missing data is under 5%. In this instance, it can be dismissed and any imputation technique available may be applied to deal with missing data (Hair et al., 2010). Therefore, for this study, missing data were replaced with a mean of each variable because the percentage of missing cases for each variable is small (Gilley & Leone, 1991). The item and respondents replaced with mean are BI4 (R168), IT13 (R169), and P1, P2, P3, P4, P5 (R93 and R154).

4.8.1.2 Detection of Outliers

The second step in preliminary analysis is to check for univariate and multivariate outliers. Outliers explain scores that are significantly different from the other scores in the data set (Field, 2017). The outliers can bias a parameter estimate and even have greater influence on estimating the standard error (Field, 2017). The current study examined both univariate and multivariate outliers. Univariate outliers are the extreme cases that have uncommon values for each variable and are inspected by standardized Z-score with $\pm$3.29 (Tabachnick & Fidell, 2013). Multivariate outliers are cases with unusual combined values for two or more variables and are examined through a standardized Z-score with a $\pm$3.29 critical cut off value using a centroid Mahalonobis distance measure.

As explained by Barnett and Lewis (1994), outliers are inconsistent observations with the rest of the data set. Furthermore, Tabachnick and Fidell (2007; 2013) claimed that outliers may be identified by observing the Mahalanobis distance which refers to the distance of a case from the centroid of the other cases. Particularly, the centroid refers to the point calculated using the means of all variables (Tabachnick & Fidell, 2007; 2013). Outliers are defined by Meyers, Gamst, and Guarino (2016) as cases with extreme or unusual values. Hair et al., (2010) termed as substantially dissimilar observation compared to the remaining observations. While extreme values in a single variable are called univariate outliers, multivariate outliers are extreme values displayed on a compounding of two or more variables. Tabachnick and Fidell (2007; 2013) indicate that the presence of an outlier in a data set is caused by the following four grounds:

a. Incorrect data entry

b. Failure to fix a missing value

c. Outlier is not a member of the population under study

d. Although the outlier is from the intended population the distribution of the variable in the population has more extreme values than a normally distributed data.

4.8.1.3 Normality

The third step was to check for normality. Therefore, the normality of variables must be examined prior to further analysis. The assumption of normality is a requirement for a lot of inferential statistical techniques in statistics. Evaluation of normality assumption may be performed through the test of normality or graphically. The test of normality is available through several statistics such as the Kolmogorov-Smirnov and Shapiro-Wilks; skewness and kurtosis statistics. Graphical assumption can be executed via box plot, histograms, detrended normal plot, normality plot, and stem and leaf plots. The current study normality of the data is analysed through Kolmogorov-Smirnov, and Shapiro-Wilks; Kurtosis, and skewness test (Shapiro & Wilk, 1965).

Early data screening is essential to examine the symmetry for the distribution of data. Pallant (2011) recommended using significance tests of skewness and kurtosis to test for normality to observe any significant difference from zero among the symmetry indicators. Nevertheless, for large samples ($N > 300$), these examinations tend to not show normality with merely minor deviations. Tabachnik and Fidell (2007) explained that larger sample sizes decrease the standard errors for skewness and kurtosis. Another approach is to monitor the distribution's visual appearance using Q-Q plots and P-P plots, as well as the real skewness and kurtosis values, to measure the level of non-normality (Cohen, Cohen, West, & Aiken, 2003; Tabachnik & Fidell, 2007). A number of sources like George and Mallery (2001), and Dunn, Everitt, and Pickles (1993) opined that appropriate values for skewness and kurtosis must be within ±1.5 range. Meanwhile, Pallant (2011) claimed that an absolute value of 3 for skewness and an absolute value of higher than 8 for kurtosis signal critical normality problems.

4.8.1.4 Descriptive Statistics

Descriptive statistics are used to illustrate information in a form that is usable, understandable, and convenient. Descriptive summary, including mean, standard deviation, and descriptive is used to screen the data set.

4.8.2 Statistical Techniques for Data Analysis

The current study used variance-based PLS-SEM 3.0 statistical software for conducting the main analysis and for testing the hypotheses (Ringle, Wende & Becker, 2014). SEM is the most important, dominant, and widely accepted statistical technique in social research (Peng & Lai, 2012). SEM is a multivariate technique that brings together features such as principal component analysis and linear regression analysis (Fornell & Bookstein, 1982) and is particularly used for developing and testing theories in multivariate analysis (Hair, Sarstedt, Ringle & Mena, 2012; Ringle, Sarstedt & Straub, 2012; Shook, Ketchen, Hult & Kacmar, 2004).

Other advantages of the PLS technique are normal data distribution is not required and small sample sizes can be used (Chin & Newsted, 1999). The PLS path modelling, also known as component-based structural equation modelling, is appropriate to be used for evaluating the hierarchical model of this study, emphasising theoretical parsimony rather than model complexity. Besides, it is suggested that PLS can manage the reflective and formative variables that occur together in a structural model (Falk & Miller, 1992). Nevertheless, all constructs in the current study were reflective measurements.

The PLS analysis was selected in this study to assess the measurement model from the context of structural models. In particular, PLS is a structural equation modelling tool that generates weights and loadings among constructs and items for a path concerning the constructs. Furthermore, it yields standardised regression coefficient estimates such as the β coefficients (Claver-Cortés, Pertusa-Ortega, & Molina-Azorín, 2012; Croteau & Bergeron, 2001). As a variance-based approach, the PLS is superior compared to the covariance approach.

The measurement model is assessed based on two criteria; the reliability and the validity of the items for each construct which can be uni-dimensional (first-order) constructs and multi-dimensional with two order constructs (first and second-order). In the current study, the researcher analysed the measurement model by assessing the reliability and validity of variables, namely business intelligence systems adoption, information technology infrastructure, innovation, competitive environment and performance.

In estimating SEM, the researchers have to select between Covariance-Based Structural Equation Model (CB-SEM) (Diamantopoulos & Siguaw, 2006; Jöreskog, 1978) and the PLS-SEM (Hair, Hult, Ringle & Sarstedt, 2016; Rigdon, 2012). CB-SEM focuses on testing theoretically established models by reducing the difference between the implied model and the sample covariance matrix. On the other hand, PLS-SEM is a prediction-oriented variance-based approach that centres on maximising the explained variance in endogenous constructs (dependent variables). Additionally, PLS-SEM is more appropriate for complex relationships because it avoids the problems of inadmissible solutions and factor indeterminacy that exists in CB-SEM (Chin, 1998; Fang & Chiu, 2010; Fornell & Bookstein, 1982). Furthermore, PLS-SEM also allows a two-step approach for data analysis. The first step tests the measurement model, and the second step tests the structural model (Anderson & Gerbing, 1988; Fang & Chiu, 2010).

In management research, PLS-SEM is a quasi-standard method for analysing the cause and effect between latent variables (Hair et al., 2011). Previous studies put forward several reasons for using PLS-SEM. For example, it is less demanding in sample size, it solves multi-collinearity and the missing value problem, it is applied in complex models, and handles the problems of using both reflective and formative constructs together (Fang & Chiu, 2010; Lindner & Wald, 2011).

However, the most important reason for using PLS-SEM is that it is suitable for maximising the prediction and extension of research models where the predicted relationships are not tested in the previous literature (Cheung, Myers & Mentzer, 2010; He & Wei 2009; Peng & Lai 2012). Moreover, Hair et al., (2010), claim that for prediction of relationships with the structural model, PLS-SEM is preferred because this problem cannot be handled by CB-SEM, which only confirms the structural model based on well-established theories. Thus, based on the above reasons, PLS-SEM is relevant for predicting a new or less-established relationship that is seldom predicted or tested in the literature, such as the relationship between business intelligence systems adoption, information technology infrastructure, innovation, competitive environment and performance.

4.8.3 Main Analysis

There are two steps in PLS-SEM analysis (Chin, 2010; Hair et al., 2011). First is the evaluation of the outer model (measurement model) and second, the assessment of the inner model (structural model). The measurement model is performed to examine latent variables and its manifested variables, whereas the structural model is performed to study the link between the endogenous variables and the other latent variables (Tenenhaus, Vinzi, Chatelin, & Lauro, 2005). The examination of a measurement model is concerned about evaluating its indicator reliability, internal consistency reliability, discriminant reliability, and convergent reliability (Hair et al., 2011).

The reliability of internal consistency is evaluated using composite reliability and Cronbach's alpha, where the two assessments measure the items' homogeneity (Sekaran, 2003). The assumption under Cronbach's alpha is that reliability in indicator loadings is equivalent, while composite reliability takes into account the variances in indicators loadings (Henseler, Ringle & Sinkovics, 2009). Composite reliability is more suitable than Cronbach's alpha measure for evaluating a PLS measurement model because indicators loadings are prioritized based on their reliability during the estimation of model (Hair, Hult, Ringle, & Sarstedt, 2014). On the contrary, Cronbach's alpha is ideal to establish the lower estimate for internal consistency reliability (Henseler et al., 2009). The cutoff value for both measures is 0.708 to indicate acceptable reliability (Hair et al., 2011).

Similarly, indicator loading should be 0.708 and above to indicate the reliability of a loading on its latent variable. Indicator loading with value lower than 0.708 has to be considered for elimination as the item has minimal explanatory significance to the measurement model. Thus, eliminating an item is recommended if only such elimination increases composite reliability substantially above 0.708 and does not affect content validity of the fabricate. Any item that has an indicator loading below 0.40 needs to be eliminated (Hair et al., 2011).

Another two criteria that are applied to examine a measurement model is convergent and discriminant validity. Convergent validity is described as the degree to which a set of indicators denote similar underlying construct (Henseler et al., 2009). As such, the average extracted (AVE) is adopted to assess convergent validity. The 0.50 cutoff value indicates that the latent variable explains at least half of a particular indicator. Discriminant validity is defined as the degree to which the construct does not have any correlation with other different measures (Hair, Money, Samouel, & Page, 2007). This validity is evaluated using Fornell-Larcker criterion, which establishes discriminant validity at the level of indicator (Henseler et al., 2009). The Fornell-Larcker criterion states that a latent variable share higher common variance with the indicators that it is assigned to compared to other latent variables when the AVE value of the latent variable is higher than its largest squared correlation with other latent variables. At the indicator level, discriminant validity is established when each indicator's loading related to its assigned latent variable is higher as opposed to all of its cross-loadings.

The Partial Least Squares (PLS) approach to structural equation modelling (SEM) via Smart PLS 3.0 software was the second statistical technique (Ringle, Wende, & Will, 2005). Notably, this approach was applied to evaluate the validity and reliability of the measurement model, as well as to test the structural model for testing the research hypotheses. Haenlein and Kaplan (2004) claimed that the SEM is superior compared to the limited first-generation techniques including factor or cluster analysis, regression-based approaches, and ordinary least square regression (OLS).

PLS is an analysis technique used to assess the proposed model. The processes of analysing and interpreting a PLS model have two stages. In the first stage, the outer model (measurement model) is tested, whereas the second stage evaluates the inner model (structural model) (Barclay, Higgins & Thompson, 1995). It conducts simultaneous tests on the relationships between indicators and latent variables (measurement model), and the relationship between the constructs (structural model):

a. Assessment of the Measurement Model

- Overall Model Fit of the Measurement Model
- Validity of the Measurement Model (content validity, construct validity, convergent validity, discriminant validity, reliability)

b. Assessment of the Structural Model

- Overall Model Fit of the Structural Model
- Hypotheses testing for direct relationships
- Testing mediating effects
- Testing moderating effects

The current study used a two-step approach for data analysis: development and validation of the measurement model (outer model) and the estimation of the structural model (inner model) (Chin 1998; Hair et al., 2014; Henseler et al., 2009). According to Becker et al. (2012), two step approaches is suitable for the model which has unequal number of indicators for each dimension. Moreover, this approach produces parsimonious model. The measurement model (outer model) specifies the relationships between the items and their underlying constructs. However, the structural model (inner model) specifies the relationships among the latent constructs (Hair et al., 2014; Henseler et al., 2009).

4.8.3.1 Measurement Model

In the measurement model, the constructs can be modelled into reflective or formative (Fornell & Bookstein, 1982). In reflective models, indicators are determined by the construct. Reflective indicators are interchangeable, correlated with each other, adept at being omitted without changing the meaning of the construct, and linked to the construct through the loadings (Hair et al., 2014). In addition, in reflective models, the constructs can be single-item or multi-item. In formative models, indicators determine the construct and do not necessarily correlate with each other. In this case, business intelligence systems adoption, information technology infrastructure, innovation, competitive environment and performance are unidimensional reflective constructs. The measurement models as follows.

a. Internal Consistency Reliability

The first step is to measure the internal consistency reliability which measures the homogeneity of the construct's items and is assessed based on Cronbach's alpha and composite reliability (Sekaran, 2003). Cronbach's alpha assumes equal reliability for all the items' outer loadings in the population (Hair et al., 2014) and it measures the relatedness of the set of items. Cronbach's alpha shows values from zero to one where zero indicates no internal consistency while one indicates complete internal consistency.

Composite reliability measures the overall reliability of a collection of heterogeneous but similar items (Henseler et al., 2009) and is assessed through Fornell and Larcker's criteria. However, Hair et al., (2014) argued that composite reliability is a more appropriate measure of internal consistency reliability based on two reasons. First, composite reliability signifies the reliabilities based on their loadings, while Cronbach's alpha considers all loadings equally. Second, composite reliability accommodates the differences in loadings while Cronbach's alpha underestimates internal consistency reliability and it is sensitive to the number of items in a measurement model. Nevertheless, previous studies reported both criteria in accessing internal consistency reliability (Hair et al., 2014). The recommended acceptable value for both internal consistency reliability criteria should be greater than 0.70 (Hair et al., 2014).

b. Convergent Validity

The second step is to measure convergent validity, which assesses the extent to which the set of items represents the theoretically anticipated underlying variable. To measure the convergent validity, the average variance extracted (AVE) is used, which indicates all the mean values of the squared loadings of a set of items (Hair et al. 2014). The cutoff value recommended for AVE is more than 0.50 (Hair et al., 2010; Hair et al., 2014; Hair et al., 2016; Henseler et al., 2009). The AVE value of more than 0.50 explains that more than half of the variance of the construct is explained by the respective construct.

c. Discriminant Validity

The third step is to measure discriminant validity that represents the extent to which the variables are not correlated with other variable (Hair et al., 2014). Discriminant validity can be assessed by the algorithm technique, Fornell and Larcker's (1981) criteria, and cross loadings criteria. The algorithm technique assesses the significance of the outer models' indicators. The criteria to check the significance is that the t-values for the indicator's outer loadings should be greater than 1.96 with the p-value less than 0.01 (Hair et al., 2014). Fornell and Larcker's (1981) criteria for measuring discriminant validity states that "the construct should share more variance with its indicators than with any other construct" (Hair et al., 2014). To test Fornell-Larcker's criteria, the AVE of each construct should be higher than the square of the correlations among the constructs. As for the cross loadings criterion, the items (indicators) should load more on their respective constructs than on any other construct. In other words, the variance shared between the construct and its set of items should be greater than the other constructs representing different sets of items. Nevertheless, the cross loadings criterion is more liberal than the Fornell-Larcker criterion because instead of the average variance extracted, the cross loadings only require the loadings of one construct to be higher than the cross loadings of other constructs (Henseler et al., 2009).

4.8.3.2 Structural Model

After estimating and confirming the reliability and validity of measurement model, the next step in PLS-SEM is to evaluate the structural (inner) model (Henseler et al., 2009). This step involves assessing the relationship between the latent variables which are further divided into exogenous (independent) and endogenous (dependent) variables. In the current study, exogenous variables are business intelligence systems adoption and information technology infrastructure, while endogenous variables are innovation and performance. After determining the endogenous and exogenous variables, the next step is to access the criteria for evaluating and estimating the structural model, namely the path coefficient (β), the coefficient of determination (R^2), the effect size (f^2), the predictive relevance (Q^2), the mediation and moderation analysis (Hair et al., 2014; Hair et al., 2016; Henseler et al., 2009).

It is noted that few studies modelled firm performance as a formative construct. However, this depends on the indicators used and how firm performance is defined. Interchangeable measures are assumed to co-vary at a high level and are also anticipated to have the same consequences and antecedents. Thus, it is expected that omission of a measure would not modify the construct's conceptual domain. Therefore, it is more suitable to model the construct as reflective measurement.

In order to assess the structural model, Hair et al., (2014) proposed a five-step procedure in assessing the structural model. Figure 4.1 present Hair et al., (2014) five-step structural model assessment procedure.

Step 1:
Assess structural model for collinearity issues

Step 2:
Assess the path coefficient (β)

Step 3:
Assess the level of coefficient of determination (R^2)

Step 4:
Assess the effect size f^2

Step 5:
Assess the predictive relevance Q^2

Figure 4.1:
The Five-Step Procedure for Assessment of Structural Model

a. Assess structural model for collinearity issues

The first step assesses the multi-collinearity issue among the dimensions of the constructs because high collinearity among the dimensions can seriously bias the results (Hair et al., 2014). Collinearity among the dimensions can be assessed through a variance inflation factor (VIF) and a tolerance value.

b. Assess the Path Coefficient (β)

The path coefficient indicates the hypothesised relationships among the variables (Hair et al., 2014). In estimating the path coefficient, two tests are carried out to examine the strength and significance of the correlation between exogenous and endogenous variables. First, a set of variables taken as exogenous variables is regressed on the endogenous variables based on hypothesised relationships to obtain the beta (β) value. This value is obtained by running the PLS algorithm. It represents the path values under consideration (pointing from a set of exogenous variables to the endogenous variable through arrows) and is described through the standardised regression coefficient in the structural model (Hair et al., 2014; Henseler et al., 2009). The β coefficient value, which ranges from +1 to –1, explains the strength of the correlation between the exogenous and endogenous variables. If a β coefficient is positive, then the relationship between exogenous and endogenous variables is positive; if the β coefficient is negative then the relationship is negative (Hair et al., 2010; Hair et al., 2014). The higher the β value, the greater the impact of the exogenous and endogenous variables. Secondly, the significance of the path coefficient is measured through t-values. This value is obtained through a PLS bootstrapping procedure. The recommended sample for bootstrapping is 5000 (Hair et al., 2012). The cut-off point for t-values should be greater than the critical values i.e. 1.65 at $p< 0.10$, 1.96 at $p< 0.05$, and 2.58 at $p< 0.01$ (Hair et al., 2014).

c. Assess the Level of Coefficient of Determination (R^2)

Coefficient of Determination is the most critical criterion that assesses the quality of the PLS structural model. It explains the combined effect of variance from the exogenous variables on the endogenous variables (Hair et al., 2014). The effect of R^2 ranges from 0 to 1; the value equals to 1 represents the complete predictive accuracy, while the values closer to 0 represent weak predictive accuracy. The effect of R^2 values can be explained as strong, moderate, or weak.

The extant literature states that the R^2 depends on the number of exogenous variables which then are compared with the critical values (Henseler et al., 2009). R^2 should be moderate when the number of exogenous variables in the model are one or two and strong when there are several exogenous variables in the model. The rule of thumb for R^2 values normally ranges from 0.25 to 0.75. As a general rule of thumb, R^2 values of 0.75, 0.50, and 0.25 are described as strong, moderate, and weak levels of predictive accuracy (Hair et al., 2014; Henseler et al., 2009). However, the R^2 values actually depend on the field of study. For instance, the R^2 value of 0.20 is considered substantial in behavioural research (Hair et al., 2014), and the R^2 value of 0.334 is perceived as moderate in social science studies (Hayes, 2013). Nevertheless, Hayes (2013) suggested that the R^2 value should be moderate to high, meaning that it should be greater than 0.50 to indicate confidence with a model (Henseler et al., 2009).

Having established a valid and reliable measurement model, the consecutive phase is about evaluating the structural model of a PLS path model. Under PLS modelling, the primary criteria for examining a structural model are the coefficients of determination (R^2) value for the endogenous latent variable and estimate of path coefficients (Hair et al., 2014). The R^2 of the endogenous latent variables is important in evaluating the capability of the model in explaining the endogenous latent variables and to sustain the underpinning theory (Henseler et al., 2009). R^2 value of 0.19, 0.33, and 0.67 indicate weak, moderate, and substantial respectively of the model's explanatory capability. On the other hand, Hair et al., (2014), suggests R^2 values of 0.25, 0.50, and 0.75 as weak, moderate, and substantial respectively, but cautions that the appropriate level of R^2 values should be judged based on specific research field. Based on the R^2 values, the impact of certain independent variables on a dependent variable is measured.

d. Assess the Effect Size f^2

In addition to R^2 measures and path coefficient estimates, other tests that also serve to examine the structural model are the predictive relevance – Q^2 and q^2 – and effect size, f. Effect size or f^2 determines the presence of significant influence on the dependent latent variable caused by an independent latent variable via R^2 change. It is defined as follows:

$$f^2 = \frac{R^2 \text{ included} - R^2 \text{ excluded}}{1 - R^2 \text{ included}} \qquad \text{Equation 4.1}$$

R^2 excluded or R^2 included indicates the dependent variable's R^2 when the independent variable is excluded or included to be a dependent variable's predictor. Higher f^2 value signifies that the independent construct has a larger influence. Furthermore, values of 0.35, 0.15, and 0.02 can be regarded as large, medium, and small respectively (Cohen, 1988).

Effect size (f^2) evaluates the amount of total variance in the exogenous variables that is predictable from the endogenous variable. Effect size (f^2) value is changed when one of the exogenous variables is removed from the model. Thus, removing one of them will significantly alter the contribution of R^2 to the other exogenous variables. The effect size, before and after removing the exogenous variables, can be calculated using Cohen's f^2 formula (Hair et al., 2014). In Cohen's f^2 formula, effect size is calculated based on two path models. The first path model calculates the hypothesised model as predicted by the full model, namely R^2 included. The second path model calculates the path by removing the exogenous variable namely R^2 excluded. The effect size is based on the difference in the R^2 values of the first path model and the second path model. The rule of thumb for determining the significance of the effect size ranges from 0.35 (large), 0.15 (medium), and 0.02 (small) (Cohen 1988).

e. Assess the Predictive Relevance Q^2

Predictive relevance (Q^2 or q^2) is another important criterion that assesses the predictive accuracy of the structural model which is examined through the Stone-Geisserq^2 value (Hair et al., 2014). In correspondence with the calculation of effect size, the relative impact of the structural model's capability to predict the observed measures for latent endogenous variables can be assessed through q^2. The Q^2 build sample reuse technique works by omitting some parts of the data matrix, and then estimating the model with omitted estimates (Hair et al., 2014; Hair et al., 2016). The value for Q^2 is obtained through a blindfolding procedure for a certain omission distance (D) (recommended range 5 to 10) for only endogenous reflective constructs one by one. The blindfolding procedure generates a cross-validated redundancy index that measures the quality of the measurement and structural models for each set of constructs (Chin, 2010).

The model's predictive relevance may be tested via the Stone_Geisser's Q^2, which outlines that the model needs to have the ability to predict the indicators of each endogenous latent construct adequately (Chin, 2010). Q^2 is calculated through the cross-validated redundancy or cross-validated commonality score. For this study, a blindfolding procedure is used to attain the measures of cross-validated redundancy of Q^2. The recommended chosen value of omission distances *d* was between 5 and 10. If the Q^2 is lesser than zero, the model is said to lack predictive relevance (Hair et al., 2014; Chin, 2010).

The cross-validated redundancy index is used to report the Stone-Geisser q^2 value to specify the model's predictive relevance (Hair et al., 2014). The higher the value of q^2, the smaller the difference between the predicted and original values. Thus, a q^2 value that is greater than zero indicates the predictive relevance for a particular endogenous variable (Henseler et al., 2009; Marcoulides, 1998). The rule of thumb is that a predictive relevance value should be greater than 0.50 (Chin, 2010). The results obtained from the cross-validated redundancy index for q^2 are used to calculate the relative impact of the q^2 effect size that is measured through q^2. The following formula is used for calculation of q^2:

$$q^2 = \frac{Q^2 \text{ included} - Q^2 \text{ excluded}}{1 - Q^2 \text{ included}} \qquad \text{Equation 4.2}$$

4.8.3.3 Mediation Analysis

Mediation modelling can be used to explain the nature of relationships among three or more variables. It denotes a state in which a third variable (the mediator) has the capability to strengthen the relationship between independent variables and dependent variables in a structural model (Baron & Kenny 1986; Hair et al., 2014). Thus, a mediator explains the relationship between independent variables and dependent variables (Hair, Ringle, & Sarstedt, 2013).

Mediation analysis is utilised to test the effect of mediation in path models. A simple mediation model is a three variables model (A, B, and M) where A (independent variable) predicts M (a mediator variable), which in turn predicts B (dependent variable). In other words, the mediator mediates the relation between A and B, explaining the mechanism through which A and B are related. Nevertheless, in order to understand the mechanism of the mediation effect, a researcher must first understand the terms *direct* and *indirect* effect (Hair et al., 2013). The direct effect (c') shows the relationship between two variables, namely A and B, linked by a single arrow. The indirect effect involves a series of relationships by introducing at least one intervening variable, namely M (a*b) between the relationship of a and b (c'). This can be seen in Figure 4.2.

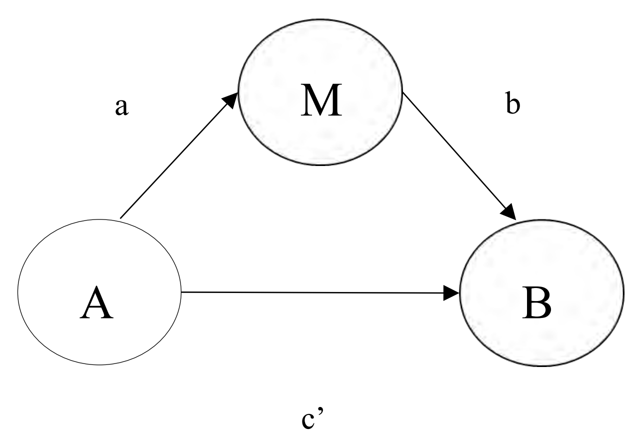


Figure 4.2:
Simple Model with Mediation Effect

Garson (2016) noted that indirect effects are effects of one latent construct on an endogenous latent variable mediated through one or more additional latent variables. According to Preacher and Hayes (2008), mediation occurs when a predictor affects a dependent variable indirectly through at least one intervening variable, or mediator. Baron and Kenny (1986) explained that generally, a given variable could be said to be functioning as a mediator to the degree that it accounts for the relation between the predictor and the criterion. Several methods are used to assess the mediation effect (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). These include the causal steps strategy (Baron & Kenny, 1986), Sobel test (Sobel 1982, 1986); the distribution of the product approach (MacKinnon et al., 2002); and the bootstrapping method.

There are two types of test for mediation, which depend on the complexity of the mediators. First, the Preacher and Hayes Mediation Macro can be employed to test the statistical significance of simple mediation, (Hayes & Preacher, 2014). Second, the Preacher and Hayes Process Macro can be used to test a model that has multiple mediations and used for multivariate analysis for linear models (Preacher & Hayes, 2008). The process tests the multiple mediation through the product of the path coefficient approach and provides more information about the significance of indirect effects (Preacher & Hayes, 2008; Rodriguez et al., 2014). The product of path coefficient assumes the normal distribution for both total and indirect effect (Preacher & Hayes, 2008). In addition, the process macro used bootstrapping method by setting the confidence interval at 95% which makes the results significant (Preacher & Hayes, 2004). There are two reasons why this study tests mediation with Process Macro. First, this study used ordinal scale (continuous variable) in order to measure business intelligence systems adoption and information technology infrastructure (independent variables) and performance (dependent variable) and the mediator is single-item variable. Therefore, the Process Macro is suitable for this kind of study to test the multiple mediations.

Two results can be reported from the Process Macro test. First, to confirm the mediation effect, the Variance Accounted Factor (VAF) is calculated and then reported. Second, to confirm the existence of mediation, the Upper Limit Confidence Interval (ULCI) and Lower Limit Confidence Interval (LLCI) are reported. If values for ULCI and LLCI are positive or negative, it signifies the existence of mediation between independent and dependent variables.

VAF indicates the ratio of indirect effect to the total effect (Iacobucci & Duhachek 2003). The following formula is used for the calculation of VAF.

$$VAF = \frac{a*b}{a*b+c} \qquad \text{Equation 4.3}$$

The result obtained from VAF explains the proportion of mediation (indirect effect) to the total effect. If the path coefficient for both direct effect (c') and indirect effect (a*b) are statistically significant, it indicates a partial mediation. On the other hand, if the direct effect is not significant and the indirect effect is significant, full mediation is expected.

4.8.3.4 Moderation Analysis

The relationship between independent and dependent variables may also be affected by moderating factors (Figure 4.3). The role of moderating variables is to strengthen or weaken the relationship between two variables. It also plays a role in changing the direction or magnitude of the predictor-outcome relationship (Baron & Kenny, 1986; MacKinnon et al., 2012). Therefore, a moderating variable is important to be considered in the conceptual framework as a means of understanding the circumstances or types of people affecting the antecedent-outcome link (Hayes & Rockwood, 2017).

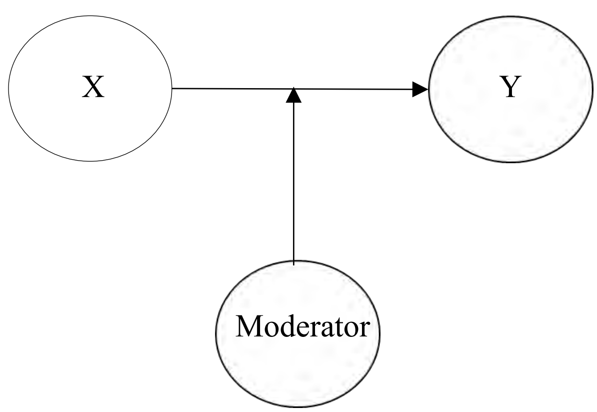


Figure 4.3:
A Moderated Relationship

To gain an understanding of how moderating effects are modelled, consider the path model shown in Figure 4.4. The moderating effect (d) is represented by an arrow pointing at the effect linking X and Y. Furthermore, when including the moderating effect in PLS path model, there is also a direct relationship (c) from the moderator to the endogenous construct. This additional path is crucial as it controls or the direct impact of the moderator on the endogenous construct. If the path c were to be omitted, the effect of M on the relationship between X and Y would be inflated. The path model in Figure 4.4 can also be expressed mathematically using the following formula:

Main Effect:

$$Y = a + b.X + b.M$$

Interaction Effect:

$$Y = a + (b + d.M).X + c.M$$

$$*Y = a + b.X + c.M + d(X*M)$$

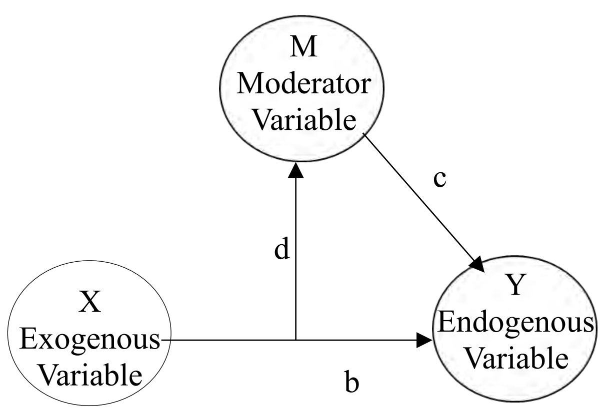


Figure 4.4:
Moderating Effect

Figure 4.4 and Figure 4.5 explain that:

- b is called the main effect when no moderator is included.
- b is called the simple effect when a moderator is included.
    - The strength of relationship when a moderator is included.
    - If the level of moderator is increased by one standard deviation unit, b is expected to change by the size of d.
- c accounts for variation in Y explained by M.

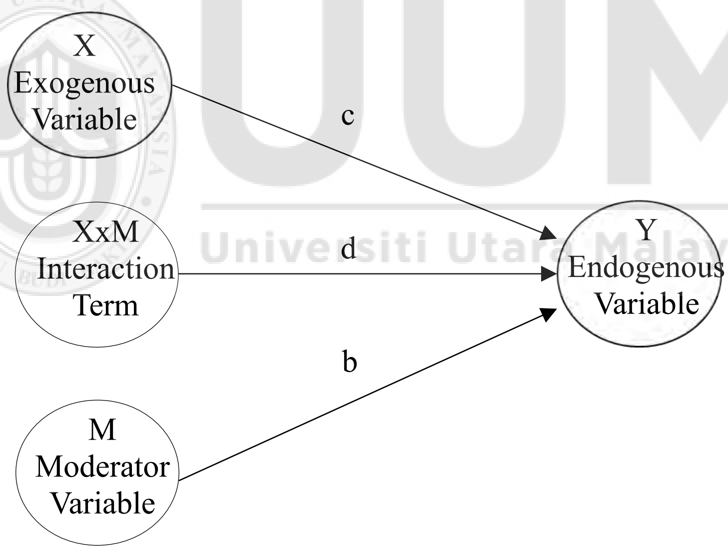


Figure 4.5:
Moderating Effect when Running Analysis

4.9 Chapter Summary

This chapter discussed the processes for collecting data to answer the current study's research questions. This chapter also explores the research paradigm, research framework, research design, research approach, variables and measurement, sampling procedures, pilot study and data collection, and data analysis. In addition, the chapter also describes in detail about how the data were collected, processed, and analysed to address the research questions and hypotheses. This chapter has also illustrated the techniques used for data analysis, namely SPSS and PLS-SEM. The outcomes of hypotheses testing and statistical analysis are discussed in depth in the subsequent chapter.

CHAPTER FIVE

RESULTS

5.0 Introduction

This chapter presents the results of the current study. First, the preliminary results, including demographic descriptive were reported. Subsequently, the PLS-SEM path modelling results are reported in two sections; the first section discusses the results of the measurement model and the second section discussed the results of the structural model. Finally, the results of the hypotheses are also discussed.

5.1 Preliminary Analysis

Preliminary analysis is important to ensure the validity and usability of data for acceptable findings. Moreover, preliminary analysis is required to meet the general assumption of multi-collinearity issues particularly when using SEM analysis.

5.1.1 Response Rate

In this study, there were 1045 randomly selected respondents were distributed as against 346 desired sample size based on the population and sample size tables as suggested by

Krejcie and Morgan (1970). However, only 191 questionnaires had been returned, thus, the response rate was 18.28 percent. This low response rate by stating that the high response rate is difficult to achieve due to the confidential nature of few requested information (Gounaris & Avlonitis; 2001; Osuagwu; 2006). After a thorough check of the filled questions and reviewing the 191 received questionnaires, merely 177 questionnaires were valid for data analysis. In all, a total of 14 responses was discarded due to incomplete or invalid submission (4 cases) and return a blank (10 cases), thus leaving only 177 samples deemed usable which resulted in an effective response rate of 16.93 percent. This response rate is deemed to be sufficient as a majority of the surveys conducted in Malaysia recorded between 10% to 20% response rate (Ramayah, Yan, & Sulaiman, 2005). The details of response rate are explained in Table 5.1.

Table 5.1:
Response Rate

Response from Respondents	Number	Percentage (%)
Total number of questionnaires distributed	1045	100%
Returned questionnaires	191	18.28%
Invalid or incomplete questionnaires	14	1.34%
Usable questionnaires	177	16.93%

5.1.2 Non-Response Bias

Non-response bias is a prominent issue in the data collection using questionnaire survey method. This exists when the act of non-participants in the study are greater (higher) than the number of participants in a population. This non-response bias normally occurs because of low response rates to the survey. It may lead to poor sampling and influence the reliability of research and its data analysis. To reduce or eliminate the non-response bias in this study, Armstrong and Overton's (1977) extrapolation method will be utilized.

Notably, non-response bias is a critical problem in survey research as it is capable of invalidating the findings by inhibiting the results from the sample to be generalised to the target population. This can be detected through prominent differences in the answers to the survey questionnaire as opposed to the non-respondents. In this case, the findings of the research are not valid to illustrate the response of the whole sample (Armstrong & Overton, 1977). In this subject field, the extrapolation method would be applied to potential non-response bias (Armstrong & Overton, 1977). Accordingly, a comparison is done with the information gathered from early respondents and late respondents; the classification is based on the order of response via medium split.

T-tests had also been used by a number of researchers to identify early or late responses. In particular, the tests highlighted any substantial difference among the two categories of respondents. Accordingly, in this research, t-tests were performed to determine the presence of non-response bias. Independent t-tests were conducted on 32 respondents who responded later than 30th May 2017 assumed as late and 145 respondents assumed as early who responded earlier than this cut-off date. The t-test was conducted on performance variable (the dependent variable) and business intelligence systems adoption, information technology infrastructure, innovation and competitive environment.

The result of this assessment indicated no statistically significant difference between all means of variables used in this study (performance, business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment) at $p>0.05$. The findings suggested that no substantial difference exists between late and early respondents in the variables tested influence the findings of this study. Therefore, it can be concluded that the two groups of responses (the early and the late responses) were derived from the same population. Thus, non-response bias does not exist in this field. Table 5.2 illustrates the complete t-tests results of this research.

Table 5.2:
Non-Responses Bias Test for Major Variables (Early and late Responses)

Variables	Timeline	N	Mean	SD	T values	Sig.	Mean Difference
Business Intelligence Systems Adoption	Early Late	145 32	5.5151 5.3211	0.78830 0.75417	1.270	0.206	0.19399
Information Technology Infrastructure	Early Late	145 32	5.2509 4.9577	0.87987 0.98134	1.671	0.097	0.29326
Innovation	Early Late	145 32	5.5420 5.3437	0.85753 0.90665	1.171	0.243	0.19820
Competitive Environment	Early Late	145 32	5.4937 5.4375	0.75583 0.67766	0.387	0.699	0.05618
Performance	Early Late	145 32	5.6916 5.6401	0.83861 0.95774	0.307	0.760	0.05154

Subsequently, the data were keyed into SPSS 20. These questionnaires were then accordingly coded and were subject to further analysis in this study using SPSS 20 and

PLS-SEM 3.0. Prior to statistical analysis, data were cleaned and screened while negatively worded item were re-coded (Pallant, 2007).

5.1.3 Missing Value

The data were edited to ensure their consistency and completeness after the data were collected. As explained by Zikmund (2003), the editing is deemed as a part of the stage for processing and analysing data. Sekaran (2000) classified respondents who answered minimum 75 % of the questionnaire to be acceptable, while excluding respondents that have more than 25 % unanswered questions. The missing data are counted as missing values (Kinnear & Taylor, 1996; Sekaran, 2000), as discussed in the following subsection.

Coding serves to transfer data from the questionnaire to SPSS and to attribute numbers for each answer (Malhotra, 1996). There are two approaches to executing these procedures: pre-coding which is done prior to answering the questionnaire and post-coding which is after the questionnaire is answered. The present research executes the coding procedure through the establishment of data file in SPSS. Furthermore, all question items had numerical values pre-coded. In order to identify any data entry error, the procedures for editing data were done after the data were entered into the data file.

Missing value analysis (MVA) performed for this study shows that the missing data is below 5%. Therefore, the missing data in the current research were replaced with a mean of each variable because the percentage of missing cases for each variable is small (Gilley & Leone, 1991). In this study, among the missing value were replaced by the mean of each variable are B14 (respondent 168), IT13 (respondent 169), and P1, P2, P3, P4, P5 (respondent 93 and 154).

5.1.4 Detection of Outliers

Cases of multivariate outliers for a combination of variables can also be detected by measures of standardized residual, Cooks's distance, and Mahalanobis distance (Tabachnick & Fidell, 2007). Standardized residual result values greater than ± 3.3 also depict the presence of multivariate outliers. Meanwhile, Cook's distance values higher than 1 may potentially be problematic and Mahalanobis distance's scores exceeding chi-squared critical values with degree of freedom equals to the number of predictors using an alpha level of 0.001 are considered outliers.

Table 5.3 showed scores of standardized residuals (less than ± 3.3) and Cook's distances (less than 1) of this study. They performed well below the threshold limitation indicating that cases of multivariate outliers were not a major problem with this data set. Since this study employed 2 independent variables, the critical chi-squared value was 16.27 with the degree of freedom (df) of 3 at a stringent alpha level of 0.001 (Pallant, 2007). The multivariate outliers among the data set were checked with the Mahalanobis distance measure, D^2. The Mahalanobis distance identified six cases with a value higher than the critical value. Hence, six cases were identified and deleted as multivariate outliers and 171 cases were retained for further analysis. Hence, confirming that the data set in the present study were normally distributed (Hair et al., 2010; Pallant, 2007).

Table 5.3:
Results of Standardized Residual, Cooks's Distance, and Mahalanobis Distance.

	Min	**Max**	**Mean**	**Std. Dev.**	**N**
Standardized Residual	-3.062	2.743	0.000	0.988	171
Cook's Distance	0.000	0.158	0.008	0.019	171
Mahalanobis Distance	0.101	14.609	3.977	3.324	171

Dependent Variable: Performance

5.1.5 Multivariate Normality

Normality can be assessed through statistical analysis. The normality of the data is analysed through Kolmogorov-Smirnov, and Shapiro-Wilks; Kurtosis, and skewness test (Shapiro & Wilk, 1965). A non-significant result with the value less than 0.05 indicates non-normality of data. The results of Kolmogorov-Smirnow and Shapiro-Wilk normality test for each variable are presented in Table 5.4. Normality test through both Kolmogorov-Smirnov and Shapiro-Wilk test result revealed that all the constructs except one are significant at $p < 0.05$. For a normally distributed data, both tests should have $p > 0.05$ (Shapiro & Wilk, 1965). The results revealed that the data are non-normal and violate the assumption of normality. All the variables showed non-significant value (less than 0.05) except for information technology infrastructure construct, which indicates the non-normality of the data for the variables.

Table 5.4:
Kolmogorov-Smirnov and Shapiro-Wilk Tests of Normality

Variables	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
Business Intelligence Systems Adoption	0.084	171	0.005	0.975	171	0.003
Information Technology Infrastructure	0.046	171	0.200*	0.991	171	0.377
Innovation	0.099	171	0.000	0.978	171	0.007
Competitive Environment	0.076	171	0.017	0.979	171	0.011
Performance	0.136	171	0.000	0.947	171	0.000

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

In addition, the study also examined the skewness and Kurtosis values. The values closer to zero signify that the data are normally distributed (Hair et al., 2013; Reinartz, Haenlein & Henseleer, 2009). In addition, Hair et al., (2013), suggested that negatively skewed data indicates non-normal distribution. The findings from the skewness and Kurtosis tests are reported in Table 5.5.

Table 5.5:
Normality Tests (Skewness and Kurtosis Results)

Variables	Mean	Standard Deviation	Skewness	Kurtosis
Business Intelligence Systems Adoption	5.5016	0.74132	0.064	-0.296
Information Technology Infrastructure	5.2773	0.79380	-0.038	-0.471
Innovation	5.5575	0.75338	-0.171	-0.427
Competitive Environment	5.4903	0.70316	-0.030	-0.142
Performance	5.6929	0.86205	-0.656	0.423

The normality of distribution was examined even though PLS-SEM generally does not have any assumption regarding data distribution as suggested by Hair et al., (2014). If the value skewness and kurtosis for the data is close to zero, it indicates normality of distribution (Tabachnick & Fidell, 2001). According to Kline (2005), a skewness value which greater than 3.0 is an "extreme" value, kurtosis value higher than 10.0 could indicate an issue and kurtosis value higher than 20.0 is extremely problematic. Further investigation on the both skewness and kurtosis also display that all the values are less than 3 and 10 respectively.

The results of the current study indicated that all variables (except business intelligence systems adoption); information technology infrastructure, innovation, competitive environment, and performance are negatively skewed, and the value of Kurtosis are not close to zero. Therefore, it can be concluded that the values violated the normality assumption. Thus, the data is not normally distributed hence the choice of PLS-SEM is appropriate.

5.1.6 Descriptive Statistics

This section presents the profiles of the organisation is fundamental as the unit analysis of this study. In this study SPSS 20 was used for the descriptive analysis of demographic.

5.1.6.1 Profile of the Organisations

This part of this descriptive analysis will report the background information of the respondents based on the bank's profile as illustrated in Table 5.6.

As depicted in Table 5.6, 39.2% or 67 from the total sample respondents are from the Islamic banks. The second largest group of respondents is from the conventional banks. They accounted for 33.3% or 57 respondents of the total respondents. The smallest group in the distribution was respondents from both type of bank; Islamic and conventional. They accounted for 27.5% or 47 respondents from the total respondents.

As depicted also in Table 5.6, 48.0% or 82 from the total sample respondents offered types of services are from the Islamic and conventional banks. The second largest group of respondents is from the Islamic banks. They accounted for 39.2% or 67 respondents of the total respondents. The smallest group in the distribution was respondents from conventional bank. They accounted for 12.9% or 22 respondents from the total respondents.

As illustrated in Table 5.6, the sample respondents are distributed across two types of bank ownership. 95.9% or 164 respondents are from local bank incorporated in Malaysia. This was followed by 4.1% (7) respondents from foreign bank.

As shown in Table 5.6, 4.1% or 7 of the respondents that have 51 and above of employees at their branch. This was followed by 23.4% (40) respondents from banks that have 10 and below employees. There are 38.6% (66) respondents, 24.6% (42) respondents and 7.0% (12) respondents whom are from organisations that have 11-20 employees, 21-30 and 31-40 employees respectively. The least of the group is 2.3% (4) respondents who are from organisations that have 41-50 employees.

Table 5.6:
Bank's Profile

Bank	Demographic Profile	Frequency	Percentage
Type of Bank	Islamic Banks	67	39.2
	Conventional Banks	57	33.3
	Development Financial Institutions	47	27.5
Types of Services Offered	Islamic Banks	67	39.2
	Conventional Banks	22	12.9
	Islamic and Conventional Banks	82	48.0
Ownership of Bank	Local Bank	164	95.9
	Foreign Banks	7	4.1
Number of Employees in your Branch	10 and below	40	23.4
	11 - 20	66	38.6
	21 - 30	42	24.6
	31 - 40	12	7.0
	41 - 50	4	2.3
	51 and above	7	4.1

5.1.6.2 Descriptive Statistics of Variable of the Study

In the effort to gain an initial general overview of the respondents, descriptive analysis was performed on all constructs of the study. Accordingly, the response of the respondents on all constructs of the study in terms of the mean, standard deviation and Pearson correlation values are summarized in Table 5.7.

Table 5.7:
Descriptive Statistics for (Mean, Standard Deviation, and Pearson Correlation)

Variables	**Label**	**Mean**	**Standard Deviation (SD)**	**BI**	**IT**	**I**	**CE**	**P**
Business Intelligence Systems Adoption	BI	5.5016	0.74132	1				
Information Technology Infrastructure	IT	5.2773	0.79380	0.664**	1			
Innovation	I	5.5575	0.75338	0.594**	0.709**	1		
Competitive Environment	CE	5.4903	0.70316	0.569**	0.570**	0.605**	1	
Performance	P	5.6929	0.86205	0.509**	0.575**	0.542**	0.484**	1

Note:
** Correlation is significant at the 0.01 level (2-tailed).
BI (Business Intelligence Systems Adoption), IT (Information Technology Infrastructure), I (Innovation), CE (Competitive Environment), and P (Performance)

As shown in Table 5.7, the mean score for business intelligence systems adoption was 5.5016 (SD=0.74132), indicating that the respondents have adopt business intelligence systems. The mean score for information technology infrastructure was 5.2773 (SD=0.79380), which shows that the respondents apply information technology infrastructure. The mean score for innovation was 5.5575 (SD=0.75338), revealing that the respondents' use innovation. The mean score for competitive environment was 5.4903 (SD=0.70316), which indicates that the respondent's environment was highly competitive. The mean score for performance was 5.6929 (SD=0.86205), indicating that the performance is good. Hence, the results of Pearson's correlation indicated that the study constructs were correlated as expected in terms of direction and significance.

In this study, the bivariate correlations between business intelligence systems adoption, information technology infrastructure, innovation, competitive environment and performance were positive and significant ($p<0.01$) with values ranging from 0.484 to 0.709. Information technology infrastructure is statistically correlated with business intelligence systems adoption ($r=0.664$, $p<0.01$). Innovation statistically correlated with business intelligence systems adoption ($r=0.594$, $p<0.01$) and information technology infrastructure ($r=0.709$, $p<0.01$). Competitive environment is statistically correlated with business intelligence systems adoption ($r=0.569$, $p<0.01$), information technology infrastructure ($r=0.570$, $p<0.01$), and innovation ($r=0.605$, $p<0.01$). In the same vein, performance is statistically correlated business intelligence systems adoption ($r=0.509$, $p<0.01$), information technology infrastructure ($r=0.575$, $p<0.01$), innovation ($r=0.542$, $p<0.01$), and competitive environment ($r=0.484$, $p<0.01$).

5.2 Main Analysis: PLS-SEM Analysis

5.2.1 Measurement Model Results

This section presents the results of the measurement model in two stages. The first stage reported the results in three steps, namely internal consistency reliability, convergent validity, and discriminant validity. The second stage reported the results of construct through convergent validity, multi-collinearity, and outer weights.

The measurement or outer model illustrates the relationship that a construct has with its indicators. All of the constructs in this study were calculated via reflective indicators; therefore, the validity and reliability of individual items were examined in the assessment of the measurement model. These analyses were performed to evaluate the reliability and validity of the measurement model: indicator reliability, discriminant validity, convergent validity, and internal consistency reliability (Urbach & Ahlemann, 2010). In the next subsections, the findings of all analyses for evaluating the reliability and validity of the measurement model are presented.

5.2.1.1 Internal Consistency Reliability and Convergent Validity

The first step reports the results for internal consistency which was assessed through Cronbach's Alpha and composite reliability scores while the second step reports the convergent validity that was assessed through Average Variance Extracted (AVE) based on Hair et al., (2014).

Table 5.8:
Results of Measurement Model (Without Deleting Items)

Construct	Items	Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Business Intelligence Systems Adoption	BI1	0.656	0.953	0.959	0.643
	BI2	0.800			
	BI3	0.823			
	BI4	0.809			
	BI5	0.790			
	BI6	0.841			
	BI7	0.795			
	BI8	0.842			
	BI9	0.794			
	BI10	0.804			
	BI11	0.816			
	BI12	0.830			
	BI13	0.803			
Information Technology Infrastructure	IT1	0.675	0.927	0.937	0.537
	IT2	0.729			
	IT3	0.617			
	IT4	0.793			
	IT5	0.734			
	IT6	0.719			
	IT7	0.653			
	IT8	0.686			
	IT9	0.800			
	IT10	0.828			
	IT11	0.791			
	IT12	0.791			
	IT13	0.675			
Innovation	I1	0.792	0.948	0.955	0.637
	I2	0.814			
	I3	0.848			
	I4	0.802			
	I5	0.727			
	I6	0.731			
	I7	0.834			
	I8	0.809			
	I9	0.840			
	I10	0.832			
	I11	0.823			

	I12	0.714			
Competitive Environment	CE1 CE2 CE3 CE4 CE5 CE6 CE7 CE8 CE9 CE10 CE11 CE12	0.715 0.755 0.721 0.788 0.662 0.703 0.649 0.729 0.806 0.744 0.726 0.701	0.919	0.930	0.527
Performance	P1 P2 P3 P4 P5	0.846 0.892 0.893 0.895 0.880	0.928	0.946	0.777

Note:
BI (Business Intelligence Systems Adoption), IT (Information Technology Infrastructure), I (Innovation), CE (Competitive Environment), and P (Performance)

Table 5.8 reports the results of the internal consistency reliabilities and convergent validity. The table shows the results of the measurement model for reflective constructs namely business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance.

For business intelligence systems adoption, the factor loadings items were satisfactory and above the threshold of 0.70 (Hair et al., 2014), except item BI1 (0.656), that were below the threshold. The average Cronbach's Alpha is also greater than the threshold value of 0.70. The composite reliability is also greater than the suggested threshold value of 0.70. In addition, the AVE met the criteria for threshold value of 0.50.

The factor loadings for information technology infrastructure items were satisfactory and above the threshold of 0.70, except items IT1 (0.675), IT3 (0.617), IT7 (0.653), IT8 (0.686) and IT13 (0.675) that were below the threshold. The Cronbach's Alpha was 0.927 and the composite reliability was 0.937 for information technology infrastructure, which is greater than the threshold value of 0.70. The AVE value for information technology infrastructure was 0.537 which was greater than 0.50.

The factor loadings of all innovation items were above 0.70 and the AVE value was 0.637. In addition, the reported Cronbach's Alpha and composite reliability for innovation were 0.948 and 0.955, which are above the threshold values of 0.70.

The factor loadings for competitive environment items were satisfactory and above the threshold of 0.70, except items CE7 (0.649), that were below the threshold. The Cronbach's Alpha was 0.919 and the composite reliability was 0.930 for competitive environment, which is greater than the threshold value of 0.70. The AVE value for competitive environment was 0.527 which was greater than 0.50.

The factor loadings for performance items were satisfactory and above the threshold of 0.70. The Cronbach's Alpha was 0.928 and the composite reliability was 0.946 for performance, which is greater than the threshold value of 0.70. The AVE value for performance was 0.777 which was greater than 0.50.

Table 5.9 reported the revised results of the measurement model after deleting the factor loading items including new factor loadings, Cronbach's Alpha, composite reliabilities, and AVE.

Table 5.9:
Results of Measurement Model (After Deleting Items)

Construct	Items	Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Business Intelligence Systems Adoption	BI2	0.783	0.954	0.959	0.662
	BI3	0.813			
	BI4	0.799			
	BI5	0.794			
	BI6	0.848			
	BI7	0.797			
	BI8	0.840			
	BI9	0.801			
	BI10	0.817			
	BI11	0.827			
	BI12	0.834			
	BI13	0.808			
Information Technology Infrastructure	IT1	0.714	0.911	0.928	0.618
	IT2	0.788			
	IT4	0.703			
	IT6	0.711			
	IT9	0.834			
	IT10	0.861			
	IT11	0.826			
	IT12	0.832			
Innovation	I1	0.792	0.948	0.955	0.638
	I2	0.814			
	I3	0.847			
	I4	0.801			
	I5	0.727			
	I6	0.731			
	I7	0.834			
	I8	0.810			
	I9	0.840			

	I10	0.832			
	I11	0.824			
	I12	0.714			
Competitive Environment	CE8	0.803	0.903	0.928	0.720
	CE9	0.866			
	CE10	0.857			
	CE11	0.860			
	CE12	0.856			
Performance	P1	0.847	0.928	0.946	0.777
	P2	0.893			
	P3	0.891			
	P4	0.894			
	P5	0.881			

Note:
BI (Business Intelligence Systems Adoption), IT (Information Technology Infrastructure), I (Innovation), CE (Competitive Environment), and P (Performance)

Any indicator loading that falls below 0.70 was already removed in order to increase the Cronbach's alpha, composite reliability and convergent validity (Hair et al., 2014). Hence, the current study's reliability and validity results for entire constructs indicated that all the measures were reliable and valid. Table 5.9 depicts individual items' reliability or factor loadings. The loadings lower than 0.50 the cut off value were eliminated from analysis in the next stage as suggested by Hair et al, 2010. Another general rule states that an indicator with a measurement loading in the 0.40 to 0.40 should be dropped if dropping it improves composite reliability (Hair et al., 2014; Hair et al., 2016). At the initial stage, the loadings of the measures are tested with the constructs they are meant to measure to evaluate individual reliability. Item with 0.70 loading or higher was set to be acceptable (Chin, 2010; Hair et al., (2010).

In the business intelligence systems adoption construct, one item BI1 were deleted due to low factor loadings and this has improved the results of the measurement model. Among information technology infrastructure items, IT1, IT3, IT7, IT8, and IT13 were deleted because of their low factor loadings. After deleting, an item from information technology infrastructure, the results of the measurement model were improved. In the competitive environment construct, seven items CE1, CE2, CE3, CE4, CE5, CE6, and CE7 were deleted due to low factor loadings and this has improved the results of the measurement model. The factor loadings of other competitive environment items were improved. Hence, upon examining of the loading, 13 indicators were eliminated as they presented loading lower than the cut of value of 0.70 as a criterion for minimum measurement loadings (Ringle, 2006). The eliminated indicator is BI1, IT1, IT3, IT7, IT8, IT13, CE1, CE2, CE3, CE4, CE5, CE6, and CE7. Therefore, at the indicator level, the composite reliability, convergent reliability, and discriminant validity was determined.

5.2.1.2 Discriminant Validity

The results for discriminant validity using Fornell-Larcker's Criteria are reported in Table 5.10. In the Fornell-Larcker Criteria, the discriminant validity was calculated by taking the square root of the AVEs of business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance, which should be greater than the correlation of other constructs. In the current study, the diagonal values for first-order or reflective constructs business intelligence systems adoption

(0.814), competitive environment (0.849), information technology infrastructure (0.786), innovation (0.798), performance (0.881) were greater than the off-diagonal values (correlations) in the same column. These results reveal that each underlying construct shares more common variance with its allocated indicators than with another underlying construct's indicators. Therefore, the results satisfied the criteria of discriminant validity based on Fornell-Larcker's criteria level (Fornell & Larcker, 1981).

Table 5.10:
Discriminant Validity

Constructs	BI	CE	IT	I	P
Business Intelligence Systems Adoption	**0.814**				
Competitive Environment	0.556	**0.849**			
Information Technology Infrastructure	0.681	0.508	**0.786**		
Innovation	0.601	0.524	0.724	**0.798**	
Performance	0.516	0.452	0.562	0.552	**0.881**

Note:
Diagonal elements highlighted in bold represents the square root of the AVE and the off-diagonal elements are simple bivariate correlations between the constructs.
BI (Business Intelligence Systems Adoption), IT (Information Technology Infrastructure), I (Innovation), CE (Competitive Environment), and P (Performance)

The results for discriminant validity, based on the cross-loading criteria for all constructs in the current study are reported in Table 5.11. The criterion for cross-loadings is that the loadings of the respective constructs' items should be greater than the cross- loadings of other constructs' items both in their respective columns and rows. The values showed in

Table 5.11 indicated the cross-loadings of business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance items.

Table 5.11:
Loadings and Cross Loadings of Construct

Constructs	Business Intelligence	Information Technology	Innovation	Competitive Environmen t	Performance
BI2	**0.783**	0.463	0.456	0.391	0.370
BI3	**0.813**	0.505	0.440	0.443	0.410
BI4	**0.799**	0.475	0.437	0.430	0.346
BI5	**0.794**	0.621	0.482	0.508	0.440
BI6	**0.848**	0.594	0.508	0.529	0.485
BI7	**0.797**	0.533	0.486	0.470	0.418
BI8	**0.840**	0.568	0.505	0.430	0.384
BI9	**0.801**	0.659	0.511	0.453	0.445
BI10	**0.817**	0.519	0.451	0.391	0.418
BI11	**0.827**	0.608	0.547	0.485	0.468
BI12	**0.834**	0.526	0.521	0.499	0.443
BI13	**0.808**	0.542	0.506	0.375	0.382
IT2	0.538	**0.714**	0.564	0.488	0.466
IT4	0.531	**0.788**	0.530	0.367	0.484
IT5	0.443	**0.703**	0.508	0.454	0.355
IT6	0.484	**0.711**	0.485	0.362	0.374
IT9	0.564	**0.834**	0.636	0.335	0.500
IT10	0.606	**0.861**	0.657	0.437	0.477
IT11	0.549	**0.826**	0.563	0.380	0.421
IT12	0.543	**0.832**	0.581	0.385	0.433
I1	0.547	0.626	**0.792**	0.420	0.457
I2	0.528	0.555	**0.814**	0.442	0.379
I3	0.538	0.597	**0.847**	0.431	0.460
I4	0.531	0.593	**0.801**	0.322	0.438
I5	0.470	0.583	**0.727**	0.377	0.414
I6	0.483	0.582	**0.731**	0.509	0.535
I7	0.411	0.534	**0.834**	0.402	0.447

I8	0.424	0.557	**0.810**	0.335	0.422
I9	0.502	0.571	**0.840**	0.476	0.466
I10	0.470	0.612	**0.832**	0.450	0.458
I11	0.477	0.592	**0.824**	0.437	0.431
I12	0.341	0.510	**0.714**	0.399	0.349
CE8	0.428	0.324	0.347	**0.803**	0.337
CE9	0.521	0.415	0.539	**0.866**	0.398
CE10	0.525	0.458	0.476	**0.857**	0.367
CE11	0.440	0.484	0.459	**0.860**	0.400
CE12	0.446	0.463	0.393	**0.856**	0.409
P1	0.507	0.539	0.510	0.367	**0.847**
P2	0.480	0.535	0.559	0.431	**0.893**
P3	0.413	0.432	0.424	0.330	**0.891**
P4	0.397	0.465	0.404	0.386	**0.894**
P5	0.456	0.487	0.507	0.462	**0.881**

Note:
BI (Business Intelligence Systems Adoption), IT (Information Technology Infrastructure), I (Innovation), CE (Competitive Environment), and P (Performance)

The loadings of all constructs' items were greater than the cross loadings of other constructs and all cross-loadings values were greater than the recommended value of 0.60. (Hair et al., 2013). The results obtained satisfied the criteria for discriminant validity. Therefore, results verified the criteria of discriminant validity at item and construct levels using all three techniques.

Discriminant validity analysis was performed to confirm that all individual constructs are truly unique. Discriminant validity indicates the degree to which a construct is different than the other constructs. Following the suggestion by Urbach & Ahlemann (2010), the discriminant validity of the measurement model was examined through both cross loading and Fornell and Larcker's (1981) criterion. Thus, the measurement model considered having discriminant validity when it fulfils these two conditions:

i) Fornell and Larcker's (1981) criterion - the AVE's square root is larger than the correlations among the measure with all other measures and,

ii) Cross-loading – the loadings of the indicators are larger against their respective construct than to other constructs.

After confirming satisfactory convergent validity, the discriminant validity was measured. Table 5.9 shows that all correlations among the dimensions were lesser compared to their respective AVE square root estimates. Accordingly, discriminant validity was positively determined (Fornell & Lacker, 1981).

The second discriminant validity evaluation is the cross loading or convergent validity. In order to establish convergent validity, there must be a high degree of correlation among two dissimilar sources reacting to similar measure (Sekaran & Bougie, 2010). Therefore, in a model, it is vital for the items to share larger variance with its measure compared to other variables. Therefore, in this study, the loadings and cross loading tables are shows in Table 5.10. These tables show that the items' loadings are larger against their respective construct than the other constructs in the model. It can be concluded that the second evaluation for the discriminant validity of the measurement model was satisfactory. Thus, the measurement model was concluded to have discriminant validity.

After establishing the convergent validity and the discriminant validity, the outer model could now be estimated. These tests for discriminant and convergent were done twice. In the first round, the measurement model was examined separately at the item level. Consecutively, the process was repeated with higher level of abstraction by substituting a construct into the model. With this method, the relationship of higher level constructs can be determined.

5.2.1.3 The Overall Measurement Model Evaluation

The objective of the measurement model assessment is to test the link between the constructs and indicators, as well as to identify the correlational relationship between constructs to confirm that each construct in the research is distinct from the others. Three assessments were carried out namely; i) assessment of consistent reliability, ii) assessment of convergent validity, and iii) assessment of discriminant validity. As shown in the previous table, almost all the construct met the minimum threshold criterion for assessment of consistent reliability.

Similarly, in the assessment of convergent validity, each of the constructs met the minimum requirement of AVE above 0.5. Almost all the factor loadings of more than 0.708 and some items are still retained even though their loadings are less than 0.708 to avoid from affecting content validity (Hair et al., 2014). Lastly, the evaluation of discriminant validity using cross loadings and Fornell and Larcker's criterion show the constructs are distinct from one another.

5.2.3 Structural Model Results

After establishing a valid and reliable measurement model, the foremost step is to assess the structural model (inner model) using PLS path analysis. The purpose of the assessment of the structural model is to confirm the theoretical or conceptual model. The basic criterion for evaluation of the structural model is that it is involved in determining the path coefficient (β), the coefficient of determination (R^2), the effect size (f^2), the predictive relevance (Q^2), (Hair et al., 2012; Hair et al., 2013; Henseler et al., 2009), as well as mediation and moderation analysis.

After the appropriateness of the measures was established, the consecutive stage is to gather evidence to support the theoretical model. As discussed in the prior chapter, the PLS-SEM analysis mainly emphasises on explaining the variance and determining the significance of the path estimates. Subsequently, the structural model was first assessed by looking at the coefficient of determination (R^2) which shows the explained variance's amount for each endogenous construct. Then, the effect size, f^2, and the predictive relevance, $Q^{2,}$ were assessed.

In order to assess the structural model, Hair et al., (2014; 2016) proposed a five-step procedure in assessing the structural model.

Step 1: Assess structural model for collinearity issues

Step 2: Assess the path coefficient (β)

Step 3: Assess the level of coefficient of determination (R^2)

Step 4: Assess the effect size f^2

Step 5: Assess the predictive relevance Q^2

5.2.3.1 Step 1: Assess Structural Model for Collinearity Issues

Prior to evaluating the structural model, the collinearity issue needs to be examined. Table 5.12 shows the VIF values are is lower than the offending value of 3.3 (Diamantopoulos & Sigouw, 2006) and below the threshold of 5 (Hair et al., 2014). The result indicated that there is no collinearity issue in the structured model.

Table 5.12:
VIF Values

Constructs	**VIF**
Business Intelligence Systems Adoption	2.137
Information Technology Infrastructure	2.635
Innovation	2.302
Competitive Environment	1.584

5.2.3.2 Step 2: Assess the Path Coefficient (β)

The assessment of path-coefficient is to evaluate the significance of a hypothesized relationship among the constructs. There are four latent constructs in the overall structural model namely; business intelligence systems adoption, information technology infrastructure, innovation and performance. A total of five hypotheses were developed to examine the relationship between the constructs. The five hypotheses were:

H1: There is a positive relationship between business intelligence systems adoption and performance.

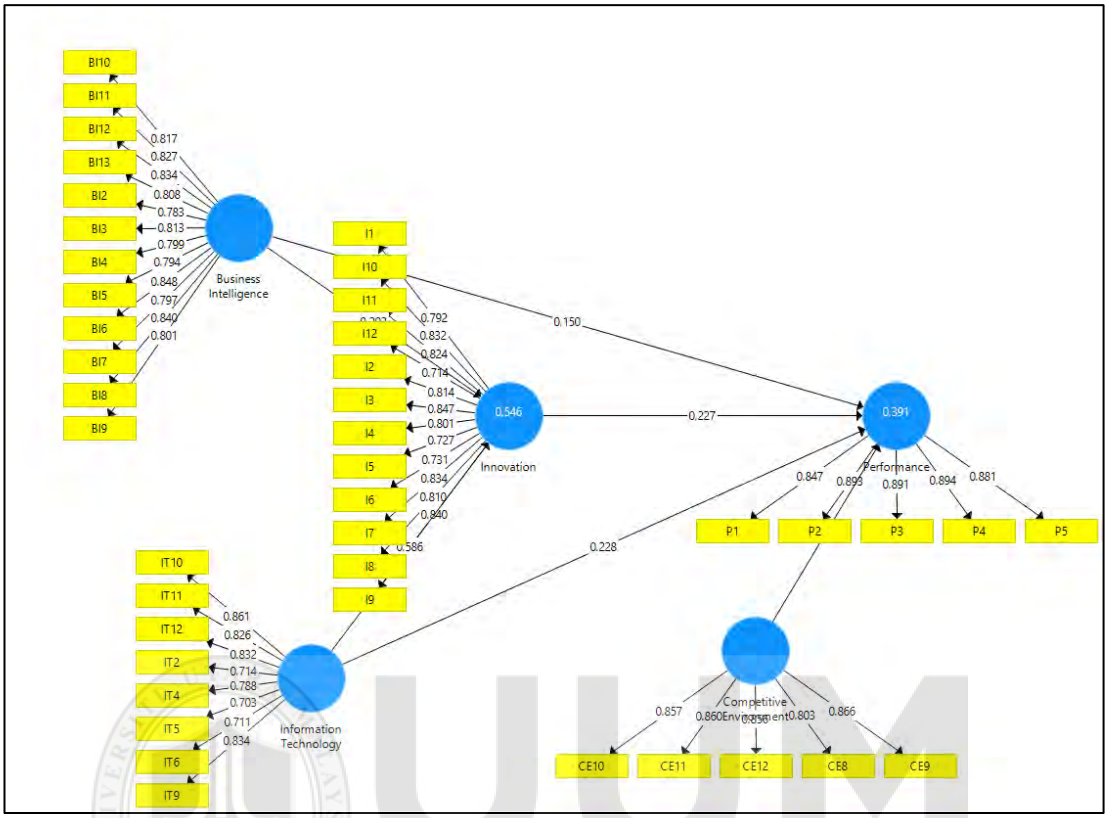
H2: There is a positive relationship between information technology infrastructure and performance.

H3: There is a positive relationship between business intelligence systems adoption and innovation

H4: There is a positive relationship between information technology infrastructure and innovation.

H5: There is a positive relationship between innovation and performance.

After running the PLS-SEM algorithm, estimated results for the Path Coefficient (β) are obtained and reported for the path model as shown in Figure 5.1. The diagram reports the results for the inner model obtained through the PLS algorithm and bootstrapping procedure.



Note:
BI (Business Intelligence Systems Adoption), IT (Information Technology Infrastructure), I (Innovation), CE (Competitive Environment), and P (Performance)

Figure 5.1:
Results of the Structural Path Model

Table 5.1 reported the results for the structural path model that include the values for the path coefficient (β), standard deviation, t-statistics, and decisions made based on the results. The conceptualised relationships were examined through the path coefficient (β) and t-values with level of significance. These path coefficient values were obtained through running a PLS algorithm, while t-statistics values were obtained through the 5000 bootstrapping resamples procedure. The obtained results must be positive (path coefficient values are positive) and significant with regard to the t-statistics values (t-statistics values greater than 1.96 or 2.58).

The results obtained indicated that the path coefficient values for the structural path model were positive, ranging from 0.088 to 0.586. For the structural path model, t-values for all the relationships were greater than 1.96 at the significance level ($p<0.05$, 2 tailed test). Therefore, the results indicated that all seven hypotheses were significantly supported. The results for each hypothesised relationship are discussed below.

The results obtained for the first hypothesised positive relationship between business intelligence systems adoption and performance was supported (H1). The path coefficient value that connected business intelligence systems adoption and performance is statistically significant with $\beta=0.088$ and $t=2.417$ ($p<0.05$). The second hypothesised positive relationship between information technology infrastructure and performance was also supported (H2). The results confirmed a significant positive relationship with $\beta=0.255$ and t-value=3.493 ($p<0.05$).

The third hypothesised relationship, between business intelligence systems adoption and innovation, was supported (H3). The results indicated a significant positive relationship between business intelligence systems adoption and innovation with $\beta=0.203$, t-value=2.680 ($p<0.05$). The fourth hypothesised positive relationship, between information technology infrastructure and innovation, was supported (H4). The results showed a positive significant relationship between information technology infrastructure and innovation with β=0.586 and t-value=8.209 ($p<0.05$).

The fifth hypothesised relationship, between innovation and performance, was supported (H5). The results indicated a positive significant relationship between innovation and performance with β=0.435 and t-value=4.608 ($p<0.05$). Hence, all the direct relationships among the variables in the structural model are significantly supported as proposed in the conceptual model for this study.

Table 5.13 shows the summarized result of the proposed structural model with regards to the path coefficients (β), standard deviation, t-statistics, and p-values. Essentially, the findings also verified whether the hypotheses are supported or not supported. The result is for H1, H2, H3, H4, and H5. There were five hypothesized links were supported.

Table 5.13:
Results of Path Coefficient (β)

Hypotheses	Relationship	Path Coefficient (β)	Standard Deviation	T-Statistics	P-Values	Result
H1	Business Intelligence Systems Adoption → Performance	0.088	0.037	2.417	0.016	Supported
H2	Information Technology Infrastructure → Performance	0.255	0.073	3.493	0.001	Supported

H3	Business Intelligence Systems Adoption → Innovation	0.203	0.076	2.680	0.008	Supported
H4	Information Technology Infrastructure → Innovation	0.586	0.071	8.209	0.000	Supported
H5	Innovation → Performance	0.435	0.094	4.608	0.000	Supported

Note:
*** value is significant 5 % (t-statistics values > 1.96)
BI (Business Intelligence Systems Adoption), IT (Information Technology Infrastructure), I (Innovation), CE (Competitive Environment), and P (Performance)

5.2.3.3 Step 3: Assess the Level of Coefficient of Determination (R^2)

The third step in evaluating a structural model is to assess the level of R^2 of a model. The R^2 commonly known as determination of coefficient used to represents the amount of variance in the endogenous constructs explained by all exogenous constructs linked to it (Hair et al., 2014). The Coefficient of Determination (R^2) values explained the model's predictive accuracy and represented the amount of variance in the endogenous constructs explained by all the exogenous constructs linked to it. The R^2 value may range from 0 to 1 and the rule of thumb for R^2 values is that they are divided into substantial (0.75), moderate (0.50), or weak (0.25) levels of predictive accuracy (Hair, Ringle, & Sarstedt, 2011; Henseler, Ringle & Sinkovics, 2009). In this study, innovation and performance are endogenous constructs and the Coefficient of Determination (R^2) values for these constructs were 0.546 and 0.391 respectively. In the current model, Coefficient of

Determination values for innovation is greater than 0.50, which indicates a moderate to high level of predictive accuracy, for performance is greater than 0.25, which indicates a weak to moderate level of predictive accuracy (Hair, Ringle, & Sarstedt, 2011; Henseler, Ringle & Sinkovics, 2009). As the R^2 values were greater than 0.50 and 0.25 (0.546 and 0.391) with fewer exogenous constructs, it is called a parsimonious model. A model is called parsimonious when it achieves an anticipated level of prediction. As expected, the current model accomplishes the required level of prediction.

5.2.3.4 Step 4: Assess the Effect Size f^2

Next, Table 5.14 displayed the effect size, f^2 of the significant paths in determining whether a change in the independent latent variable has a substantial influence on the dependent latent variable through the change in R^2. According to Cohen (1988), f^2 is assessed as 0.02 (small), 0.15 (medium) and 0.35 (large).

In the current study, f^2 is calculated by the Cohen's f^2 path model by using a formula explained in Equation 4.2 (Hair et al., 2014). The researcher estimated two path models through the algorithm procedure using PLS to calculate effect size by estimating R^2. In the first path model, the values for R^2 for the dependent variable i.e. R^2included were calculated as predicted by the full model. In the second path model the value for R2 was calculated by eliminating the exogenous variables one by one i.e. R^2 excluded. The calculated value of effect size is determined and compared with the cut-off values of the effect size where 0.02 indicates small effect, 0.15 medium effect, and 0.35 large effect (Cohen, 1992).

$$f^2 = \frac{R^2 \text{ included - } R^2 \text{ excluded}}{1 - R^2 \text{ included}} \qquad \text{Equation 5.1}$$

To obtain the first path model (full model), R^2 included was calculated by running the PLS algorithm. The results in Table 5.14 indicated that the R^2 included value for the dependent variable (performance) is 0.391. Then, the values for R^2 excluded for the second path model were calculated one by one for each exogenous variable, namely business intelligence systems adoption, information technology infrastructure, and innovation.

To obtain the f^2 value for business intelligence systems adoption on performance, information technology infrastructure, innovation, and competitive environment were excluded from the model and the PLS algorithm was run on the model. Based on the results obtained for R^2 excluded, the value of f^2 for business intelligence systems adoption was 0.02, which explained a small effect size (0.02) with small to moderate explanatory power. To obtain the f^2 value for information technology infrastructure and performance, business intelligence systems, innovation, and competitive environment were excluded from the model and the PLS algorithm was run on the model. Based on the results obtained for R^2 excluded, the value of f^2 for information technology infrastructure was 0.03, which explained a small effect size (0.02) with small to moderate explanatory power.

To obtain the f^2 value for innovation and performance, business intelligence systems adoption, information technology infrastructure, and competitive environment were excluded from the model and the PLS algorithm was run on the model. Based on the results obtained for R^2 excluded, the f^2 value for innovation was 0.04 which explained a small effect size (0.02) with small to moderate explanatory power. To obtain the f^2 value for competitive environment and performance, business intelligence systems adoption, information technology infrastructure, and innovation were excluded from the model and the PLS algorithm was run on the model. Based on the results obtained for R^2 excluded, the f^2 value for innovation was 0.04 which explained a small effect size (0.02) with small to moderate explanatory power.

The results for effect size for all paths are shown in Table 5.14. Based on the results, business intelligence systems adoption, information technology infrastructure, innovation, and competitive intelligence has a small effect size. As illustrated, business intelligence systems adoption (0.02), information technology infrastructure (0.03), and innovation (0.02), and competitive environment (0.04) have small to medium effect sizes on performance. These results show that business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment is important in explaining performance. It is shown in the table that f^2 for all construct is zero or larger than zero specifically f^2 for business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment.

Table 5.14:
Findings of Effect Size

Path	R^2 Included	f^2	Effect Size
Full Model	0.391		
Business Intelligence Systems Adoption → Performance		0.02	Small>0.02
Information Technology Infrastructure → Performance		0.03	Small>0.02
Competitive Environment → Performance		0.02	Small>0.02
Innovation → Performance		0.04	Small>0.02

5.2.3.5 Step 5: Assess the Predictive Relevance Q^2

The assessment of predictive relevance, Q^2, is to examine the exogenous constructs have predictive power over the endogenous constructs using blindfolding technique. To examine the predictive relevance of the model, the study ran the blindfolding procedure with the omission distance of 7. The suggested omission distances range from 5 to 10 (Chin, 1998). The results for the predictive relevance for the model are given in Table 5.15. The blindfolding procedure resulted in two forms of Stone-Geisser's q^2 cross-validated communality and cross-validated redundancy. The cross-validated communality index is used to evaluate the q^2 predictive relevance of the model. The cross-validated redundancy index is used to estimate the scores of the structural and measurement models. In the current study, the cross-validated redundancy values are greater than zero, this means that the model has predictive relevance and if it zero or below, it indicates a lack of predictive relevance (Hair et al., 2014). Therefore, the model has predictive relevance since the Q^2 score is greater than zero (Chin, 2010, Hair et al., 2014).

Table 5.15:
Model Predictive Relevance

Constructs	Cross-Validated Redundancy	Cross-Validated Communality
Business intelligence systems adoption		0.564
Information Technology Infrastructure		0.473
Innovation	0.322	0.541
Competitive Environment		0.548
Performance	0.241	0.617

5.2.4 Mediation Results

This section presents two hypotheses is developed to assess the mediating effect of innovation. The hypotheses are:

H6: Innovation mediates the relationship between business intelligence systems adoption and performance.

H7: Innovation mediates the relationship between information technology infrastructure and performance.

In order to assess the mediating effect of a construct in PLS-SEM, it need to develop an interaction effect between the mediator and the predicting variables and examines its effect on the endogenous variables. This study adopted the bootstrapping approach to test the mediation effect as many researchers have advocated for its use, especially with PLS-SEM (Hair et al., 2014; Hayes, 2009; Preacher & Hayes, 2008; Ramayah, Cheah, Chuah, Ting, & Mumtaz, 2018). The researcher used the bias-corrected bootstrap confidence interval option with 5000 subsamples from the SmartPLS 3.2.6 (Ringle et al., 2015) algorithm as recommended by (Hayes & Scharkow, 2013) as the most trustworthy test when power is of utmost concern.

The following will discuss the mediation of innovation in the relationship between business intelligence systems adoption and performance (H6), and between information technology infrastructure and performance (H7) respectively. Table 5.16 shows the results from direct and indirect effects from the structural model via the bootstrapping technique.

Table 5.16:
Bootstrapping (Direct and Indirect Effects)-Hypotheses Testing for Mediator

Hypotheses	Relationship	Path Coefficient (β)	Standard Deviation	T-Statistics	P-Values	Result
H1	Business Intelligence Systems Adoption → Performance	0.088	0.037	2.417	0.016	Supported
H6	Business Intelligence -> Innovation -> Performance	0.113	0.045	2.484	0.013	Supported

H2	Information Technology Infrastructure → Performance	0.255	0.073	3.493	0.001	Supported
H7	Information Technology -> Innovation -> Performance	0.325	0.059	5.545	0.000	Supported

Furthermore, from Table 5.17, mediation effects are confirmed as hypothesised between business intelligence systems adoption and performance (H6), and between information technology infrastructure and performance (H7) respectively as recommended by (Preacher & Hayes, 2008) as there is no zero between the LL (5%) Confidence Interval (CI) and the UL (95%) CI. The bootstrapping analysis has shown that two indirect effects, β=0.113 and β=0.325, are significant with the t-values of 2.484 and 5.545 (Table 5.16). The indirect effects 95% Boot Confidence Interval Bias; (LL=0.003, UL=0.035); and (LL=0.005, UL=0.221), do not straddle a 0 in between indicating there is mediation (Preacher & Hayes, 2004. 2008). Thus, it can conclude that the mediation effects are statistically significant.

Table 5.17:
Bootstrapping (Indirect Effects)-Confidence Interval Bias Corrected Hypotheses Testing for Meditator

Hypotheses	Relationship	Path Coefficient (β)	Sample Mean (M)	Bias	LL 5%	UL 95%	Result
H6	Business Intelligence -> Innovation -> Performance	0.113	0.115	0.045	0.003	0.035	Supported
H7	Information Technology -> Innovation -> Performance	0.325	0.329	0.059	0.005	0.221	Supported

Note:
LL-Lower Level, UP-Upper Level

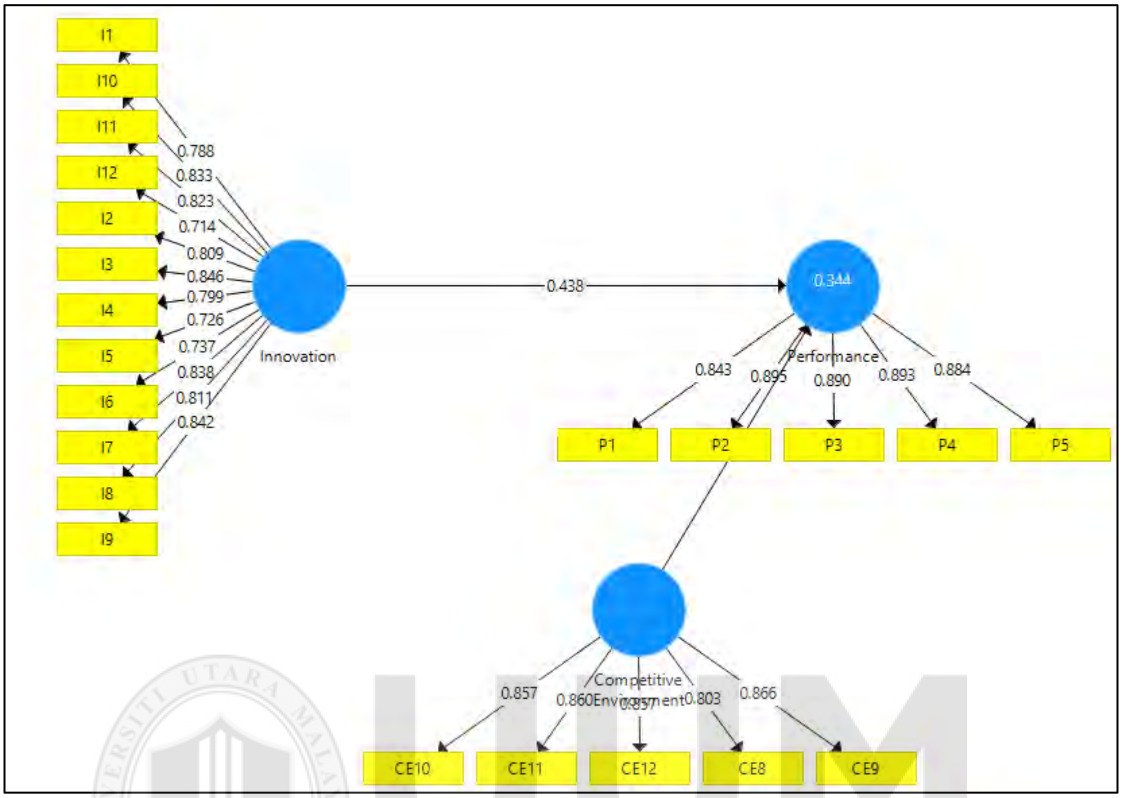
H6 predicted the mediation of innovation between business intelligence systems adoption and performance. In confirming the mediation, the values for LL and UL for indirect effects (0.003 and 0.035) were positive. The values other than zero indicate significance of mediation (Hayes, 2013). The results indicate significant and positive relationships through direct (relationship between business intelligence systems adoption and performance) and indirect effects (business intelligence systems adoption to innovation and innovation to business intelligence systems adoption). The results revealed a partial mediation of innovation between business intelligence systems adoption and performance.

H7 predicted the mediation of innovation between information technology infrastructure and performance. In confirming the mediation, the values for LL and UL for indirect effects (0.005 and 0.221) were positive. The values other than zero indicate significance of mediation. The results indicate a significant and positive relationship through direct (relationship between information technology infrastructure and performance) and an indirect effect (information technology infrastructure to innovation and innovation to performance).

The results of H7 (regarding mediation of innovation) were also significant because of direct effects (relationship between information technology infrastructure and performance) and indirect effects (relationship between information technology infrastructure and innovation and relationship between innovation and performance). The results supported a partial mediation by innovation between information technology infrastructure and performance. Hence, innovation partially mediated in hypotheses H6 and H7

5.2.5 Moderating Results

The following section present the findings for each of the analysis used to evaluate the reliability and validity of the measurement model for this study. Figure 5.2 illustrates the assessment of the moderating effect of competitive environment in the structural model.



Note:
I (Innovation), CE (Competitive Environment), and P (Performance)

Figure 5.2:
Moderating Effect of Competitive Environment

The following hypotheses were tested:

H8 The hostile the competitive environment, the weak the relationship between innovation and performance.

H8 predicted the moderating of competitive environment between innovation and performance. Table 5.18 shows the predicted results of competitive environment moderates the relationship between innovation and performance. The results indicate significant and positive relationships through direct (relationship between innovation and performance). The relationship between innovation and performance was not moderated by the competitive environment (β=0.001, t=0.023, and p=0.981).

Table 5.18:
Hypotheses Testing Results for Moderator

Hypotheses	Relationship	Path Coefficient (β)	T-Statistics	P-Values	Result
	Innovation -> Performance	0.438	4.600	0.000	Supported
	Competitive Environment -> Performance	0.223	2.399	0.017	Supported
H8	CE*Innovation -> Performance	0.001	0.023	0.981	Not Supported

This section presents one hypothesis is developed to assess the moderating effect of competitive environment. Specifically, it shows that competitive environment does not moderates the relationship between innovation and performance. In other word, competitive environment did not moderate the relationship between innovation towards performance.

5.3 List of Hypotheses Testing and Result

This section summarizes all the hypotheses which has been discussed in Chapter 3 and the findings which are discussed in this preceding section. Table 5.19 shows the summary of all hypotheses testing findings. Subsequently, the findings of the analysis are further discussed in the following chapter.

Table 5.19:
List of Hypotheses Testing and Result

Hypotheses	Hypotheses Statement	Finding
H1	There is a positive relationship between business intelligence systems adoption and performance.	Supported
H2	There is a positive relationship between information technology infrastructure and performance.	Supported
H3	There is a positive relationship between business intelligence systems adoption and innovation.	Supported
H4	There is a positive relationship between information technology infrastructure and innovation.	Supported
H5	There is a positive relationship between innovation and performance.	Supported
H6	Innovation mediates the relationship between business intelligence systems adoption and performance.	Supported
H7	Innovation mediates the relationship between information technology infrastructure and performance.	Supported
H8	The hostile the competitive environment, the weak the relationship between innovation and performance.	Not Supported

5.4 Chapter Summary

This chapter presented the findings of the study, which include the results of the preliminary analysis, such as dealing with missing values, removing outliers, demographic information of the respondents, multivariate normality assumption, multi-collinearity, and descriptive statistics of the respondents. It also reported the results of the measurement model, namely the outer loadings, average variance extract, composite reliability, and Cronbach's Alpha. The results of the structural model were also reported, including the path coefficient (β), the coefficient of determination (R2), the effect size (f2), and the predictive relevance (Q2). The study reported the mechanism of mediation using direct and indirect effects and the significance of the hypotheses. Finally, the moderating effect of on the relationship between independent and dependent variable are also discussed.

CHAPTER SIX

DISCUSSION AND CONCLUSION

6.0 Introduction

This chapter begins with the overview of the study. Next, the chapter will discuss the findings followed by theoretical contributions and managerial implications of the thesis. Next, the chapter discusses the limitations and suggestions for future research. Finally, it summarises the findings of the study leading to several conclusions.

6.1 Overview of the Study

This study focuses on the relationships between business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance, from the perspectives of knowledge-based view, RBT, and contingency theory.

The current study answered five main research questions, 'Does business intelligence systems adoption influence performance?, 'Does information technology infrastructure influence performance?, Does innovation mediate the relationship between business intelligence systems adoption and performance?, Does innovation mediate the relationship information technology infrastructure and performance?, and Does competitive environment moderate the relationship between innovation and performance?

Based on these five research questions, eight hypotheses were developed. Five hypotheses were developed to examine the direct relationships between this study's construct namely between business intelligence systems adoption and performance (H1), information technology infrastructure and performance (H2), business intelligence systems adoption and innovation (H3), information technology infrastructure and innovation. (H4), and innovation and performance (H5). The remaining two hypotheses were developed to investigate a mediating role of innovation between business intelligence systems adoption and performance. (H6) and a mediating role of innovation between information technology infrastructure and performance (H7). The last hypotheses (H8) were developed to examine a moderating role of competitive environment between innovation and performance. The results of the hypotheses were examined and reported in the previous chapters. Next, the findings of the hypotheses will be discussed according to the research questions.

6.2 Discussion on Results

This section discusses the results obtained and reported in the previous chapter. The results for both direct and indirect relationships of this study's constructs are discussed according to the research questions. Summary of the research questions, research objectives, hypothesis, and findings of this study is presented in Table 6.1.

Table 6.1:
Research Questions, Objectives, Hypothesis, and Findings

Research Questions	**Research Objectives**	**Research Hypotheses**	**Findings**
Does business intelligence systems adoption influence performance?	To examine the relationship between business intelligence systems adoption and performance.	H1: There is a positive relationship between business intelligence systems adoption and performance.	Supported
Does information technology infrastructure influence performance?	To examine the relationship between information technology infrastructure and performance.	H2: There is a positive relationship between information technology infrastructure and performance.	Supported
Does innovation mediate the relationship between business intelligence systems adoption and performance?	To examine the mediation effect of innovation on business intelligence systems adoption and performance.	H3: There is a positive relationship between business intelligence systems adoption and innovation. H5: There is a positive relationship between innovation and performance. H6: Innovation mediates the relationship between business intelligence systems adoption and performance.	Supported Supported Supported
Does innovation mediate the relationship information technology	To examine the mediation effect of innovation on information technology	H4: There is a positive relationship between information technology	Supported

infrastructure and performance?	infrastructure and performance.	infrastructure and innovation. H5: There is a positive relationship between innovation and performance. H7: Innovation mediates the relationship between information technology infrastructure and performance.	Supported Supported
Does competitive environment moderate the relationship between innovation and performance?	To examine the moderating effect of competitive environment on the relationship between innovation and performance.	H8: The hostile the competitive environment, the weak the relationship between innovation and performance.	Not Supported

6.2.1 Does Business Intelligence Systems Adoption Influence Performance?

Based on this research question, the study proposed a positive relationship between business intelligence systems adoption and performance (H1). The findings of the PLS analysis revealed that there is a significant positive relationship between business intelligence systems adoption and performance sharing with $\beta=0.088$, $t=2.417$ ($p<0.05$). The results indicated that the more the user utilized the business intelligence systems, the more performance is generated in banking institutions. This finding is consistent with the knowledge-based view of business intelligence systems adoption and previous empirical studies.

The significant relationship between business intelligence systems adoption and performance in the findings of this study is strongly supported by the literature within this field (Chen, 2012). It is also consistent with past and recent literature and studies on business intelligence in organisations (Fang & Lin, 2006; Hou, 2012; Kahaner, 1996; Lee, Park, & Lim, 2013; Park & Rim, 2011; Wu & Chen, 2014; Owusu, 2017). This finding is also similar with many other findings in various contexts by previous researchers, underlining the significant link of business intelligence systems adoption that affects organisational performance. Thus, business intelligence should be considered as a strategic component of an organisation due to its contribution to organisational performance in terms of productivity, competitive position, sales, and profitability.

In addition, the knowledge-based view of business intelligence systems adoption emphasises the knowledge from business intelligence in the form of actionable intelligence is a core competency that allows firms to develop greater strategy and better performance (Barney, 1991; Gilad, 2011; Hamel & Prahalad, 1994; Karanja, 2011; McGonagle & Vella, 1996; Owusu, 2017). This is an indication that once business intelligence systems are continuously used in the organisation, it helps the employees to monitor their ability to launch new products, create more value for customers and improve operating efficiencies (Kaplan & Norton, 1996; Owusu, 2017). This implies that the banks continue to adopt of business intelligence systems significantly improves their ability to improve their operating efficiencies. Therefore, it could be postulated that more employees adopt business intelligence systems and the more they are inclined to increase organisational performance.

6.2.2 Does Information Technology Infrastructure Influence Performance?

The second research question of this study, 'Does information technology infrastructure influence performance? A positive relationship between information technology infrastructure and performance was predicted by H2. The findings of the PLS analysis revealed that there is a significant positive relationship between information technology infrastructure and performance with $\beta=0.255$, $t=3.493$ ($p<0.05$). The results indicated that the more the capability of the information technology infrastructure, the more performance is generated in banking institutions. The significant positive relationship between information technology infrastructure and performance is consistent with the information study literature as well as empirical findings of the existing literature.

Information technology infrastructure has been extensively studied in information study research. The finding of this study provided empirical support for hypotheses H2 in which information technology infrastructure was a key contributing component for organisational performance (Bani, 2011; Bharadwaj, 2000; Chen, 2012). These findings have shown the important role of information technology infrastructure in enabling organisational performance. An information technology infrastructure can quickly assist to integrate heterogeneous data sources, give accurate information to decision makers where and when it is needed, and make organised performance valuable. This study has provided empirical support from previous studies which revealed that information technology infrastructure had the greatest impact on organisational performance (Bharadwaj, 2000; Chen, 2012; Chen, Wang, Nevo, Benitez-Amado, & Kou, 2015).

This study contributes to the growing body of literature linking information technology and RBT and provides a framework for understanding on how information technology appropriately viewed to increase organisational performance. This study provides an identification of information technology in terms of connectivity, hardware compatibility, and modularity develops the notion of information technology as an organisational performance. Viewed from RBT perspective, the empirical finding indicates that information technology components to support organisational performance. The results from this study serve to inform the debate about the business value of information technology.

6.2.3 Does Innovation Mediate the Relationship Between Business Intelligence Systems Adoption and Performance?

This section answers the third research question, 'Does innovation mediate the relationship between business intelligence systems adoption and performance?' Three hypotheses, H3, H5, and H6, are based on this research question, and aim to meet the third research objective, which is to examine the mediation effect of innovation between business intelligence systems adoption and performance. The conceptual model predicted a direct relationship between business intelligence systems adoption and performance, and an indirect relationship between business intelligence systems adoption and performance through the mediation of innovation. In testing the stated hypotheses, PLS's bootstrapping method was used. The results obtained supported both the direct and indirect relationships mentioned and hence, indicated a partial mediation of innovation between business intelligence systems adoption and performance. The direct and indirect relationships were explained through the discussion provided on H1, H3, H5, and H6. The results for H1 showed a direct, positive, and significant relationship between business intelligence systems adoption and performance that has already been discussed in Section 6.2.1 and the other three hypotheses H3, H5, and H6 will be discussed in the following sub-sections.

6.2.3.1 Business Intelligence Systems Adoption and Innovation

The current study supported the findings of H3 in that there is a significant positive relationship between business intelligence systems adoption and innovation with $\beta=0.203$ and $t=2.680$ ($p<0.05$). This means that the more utilization of business intelligence systems by employees, the more likely they are to be innovated. The significant positive relationship between business intelligence systems adoption and innovation is consistent with the knowledge-based view and the results of previous studies. Knowledge-based view posits that business intelligence enable the improvement of a company's ability to manage and implement organisational innovation.

In addition, the component of business intelligence such as user, system, and task adapted from these studies directly affect the innovation. Business intelligence is a key factor for innovation in scientific research and provides insight to understand the impact of business intelligence on innovation (Hussein et al., 2011). The knowledge-based view indicate that the use of a business intelligence leads to achieving innovation and ensures the performance of the organisation.

6.2.3.2 Innovation and Performance

This study also supported the findings of H5, that there is a significant positive relationship between innovation and performance with $\beta=0.435$ and $t=4.608$ ($p<0.05$). This indicates that the higher the bank innovate, the more likely the bank will increase the performance. The significant positive relationship between innovation and performance was consistent with the RBT and the results of previous studies. The RBT argues for innovation as a key driver of firm performance and survival.

Findings from the study suggested that banks' innovation might affect bank performance. The finding of innovation has been associated with performance is consistent with previous research across different countries like Malaysia (Amran, Lynn Ling, & Sofri, 2007; Ambad, 2014; Nazri, 2015), Pakistan (Hameed & Azmi, 2011), Korea (Yoo, 2001), and Instanbul (Karacaoglu, Bayrakdaroglu, & San, 2012), and others (Hashi & Stojcic, 2013; Wang & Zhan, 2009; Wiklund, 1999; Yoo, 2001). While other studies showing the same concept particularly impact on profitability, sales, and return on investment (Kreiser, Marino, & Weaver, 2002; Tajeddini, 2011, Nazri, 2015; Nazri, Wahab, & Omar, 2015).

This indicates that banking institutions should be more innovative in adopting or implementing new idea or process especially in managing their business activities. Nowadays, organisations must be innovative to ensure they are able to remain competitive within the rapid pace of business environment. Hence, they must keep continue research and development initiatives.

The findings of this study are useful in extending the RBT that innovation is the unique intangible resource and capability of the firm that generates sustainable competitive advantage by capitalising on emerging market opportunities. This is because innovations have the characteristics of being valuable (especially in exploiting opportunities and neutralizing threats in business competition), rare among business competitors (always looking for newness), inimitable (innovative firms often introduce new products, services and processes), and non-substitutable (Barney, 1991; Chen et al., 2015).

It can be summed up that, innovation at organisation level is essential for the organisation's profitability and overall organisational performance. In addition, today's business environment requires the organisation to be innovative in order to adapt with the rapid changes in product life cycles, technologies, competitors, customer preferences and laws. (Projogo; 2006; Karanja, 2011). Organisation should be responsive to new customer preferences, by introducing new products and services that meet the customers' needs and demands.

6.2.3.3 Mediation of Innovation Between Business Intelligence Systems Adoption and Performance

The results of H6 revealed that innovation does partially mediate the relationship between business intelligence systems adoption and performance. The mediation test results for indirect the Lower Limit Confidence Interval (LLCI) and Upper Limit Confidence Interval (ULCI), showed the same positive trends for indirect (LLCI 0.003 and ULCI 0.035) relationships. Accordingly, the findings of this test confirmed the role of innovation as a (partial) mediator in the relationship between business intelligence systems adoption and performance (Owusu, 2017).

This result corroborates the findings by Hussein et al., (2011); and Tanev and Bailetti (2008); that business intelligence leads to innovation, creation of ideas and which in turn increase in performance among the organisation. This also leads to a strong support to the reasoning by Petrişor and Străin (2013), Jaworski, Macinnis, and Kohli (2002), and Krücken-Pereira, Debiasi, and Abreu (2001) that business intelligence is a tool for innovation that supports an organisation's business strategy, market penetration, development, and performance.

The mediation of innovation between business intelligence systems adoption and performance is also supported by the knowledge-based view of business intelligence systems adoption which claims that the benefits of business intelligence systems adoption are only available when members in an organisation circle use their knowledge (Arias

Aranda & Fernandez, 2002; Cheng et al., 2009; Chuang, 2004; Conner & Prahalad, 1996; Elbashir et al., 2011; Grant, 1996; Herschel & Jones, 2005; Sveiby, 2001; Wisner, 2003;). In addition, the findings also supported the knowledge-based view such as business intelligence enable the improvement of a company's ability to implement organisational innovation.

The importance of business intelligence systems adoption among others is it serves as a prerequisite to ensuring a successful accumulation of knowledge among managers, which could be used to continuously innovate in product and process innovation, which in turn effect the performance of an organisation.

6.2.4 Does Innovation Mediate the Relationship Between Information Technology Infrastructure and Performance?

Hypotheses H4, H5, and H7 are based on the fourth research objective, to examine the mediation effect of innovation between information technology infrastructure and performance. The conceptual model predicted a direct relationship between information technology infrastructure and performance, and an indirect relationship between information technology infrastructure and performance through the mediation of innovation. In testing the stated hypotheses, Preacher and Hayes' bootstrapping method was used, and the results supported a significant partial mediation of autonomous motivation between information technology infrastructure and performance. Among these hypotheses, H2 and H5 were already discussed in Section 6.2.2 and Section 6.2.3.2, while H4 and H7 are discussed below.

6.2.4.1 Information Technology Infrastructure and Innovation

The current study supported the findings of H4 that there is a significant positive relationship between information technology infrastructure and innovation with $\beta=0.586$ and $t = 8.209$ ($p<0.05$). This means that the more the capability of information technology infrastructure in organisation, the more likely the organisation members are able to create innovation. The significant positive relationship between information technology infrastructure and innovation was consistent previous study in information study. The result of H4 is in line with literature because previous studies supported the relationship of information technology with innovation (Chen et al., 2015; Gloet &Terziovski, 2004; Karanja, 2011; Prajogo & Sohal 2003).

The findings of the current study are in line with RBT in that the capability of information technology infrastructure can stimulate their innovation practices in a work environment (Brynjolfsson & Schrage, 2009; Karanja, 2011). In the current study, information technology infrastructure is present in the banking institutions. The information technology infrastructure imparts innovation in banking institutions and becomes a source of their innovativeness in implementing the information technology in organisations. The organisation's performance depends on the information technology infrastructure, because the infrastructure allows the organisation to develop new processes and product quickly. The speed with which an organisation can implement those processes and product improves its performance.

6.2.4.2 Mediation of Innovation between Information Technology Infrastructure and Performance

The results of H7 show that innovation does partially mediate the relationship between information technology infrastructure and performance. It is implied that information technology infrastructure is positively and significantly related to performance both directly and indirectly. The results of mediation tests for the LLCI and ULCI indicated the same positive trends for indirect (LLCI 0.005 and ULCI 0.221) relationships. Accordingly, the findings of this test indicated the importance of innovation in the relationship between information technology infrastructure and performance.

On the role of innovation as a mediator between information technology infrastructure and performance, the statistical analyses yielded positive and statistically significant results supporting the predicted hypothesis of a positive relationship between innovation and performance (Karanja, 2011). Mundra et al., (2011) showed that innovation are the factors that affect the competitive advantage accomplishment and performance. Innovation are the main antecedents for performance (Hana, 2013). The relationship between innovation and performance is supported by the RBT which predicts that an employee's innovativeness is more likely to perform to improve the organisational performance.

6.2.5 Does Competitive Environment Moderate the Relationship Between Innovation and Performance?

The results of H8 show that competitive environment does not moderate the relationship between innovation and performance. It was found that competitive environment was insignificantly moderated and not supported H8 in explaining the relationship between innovation and performance. Competitive environment of this study consisted two dimensions, namely market turbulence, and technological turbulence.

Contingency theory suggests that superior firm performance can be achieved when the key variables such as the environment, industry conditions, organisational structures, and strategies are aligned (Turulja & Bajgoric, 2018). Conducting business in stable and favourable environments is rather different from doing business in risky, unfavourable, hostile and unstable environments. It can be concluded that, when the environment in which the firms operate is highly uncertain with frequent changes, products and service become obsolete quickly, unpredictable actions by competitors and hostile and risky customers, the firms will be more innovative, take more risks, be less formalized, specialized and decentralized. In addition, they will be conducting more venturing, and this will subsequently affect firm growth positively. This is similar to the findings in China (Li, Sun, & Montgomery, 2005, 2011; Mu & Benedetto, 2011), Spain (Martins & Rialp, 2013), and Netherlands (Kraus, Rigtering, Hughes & Hosman, 2012). This result is along with Wong's (2014) statement that competitive environment is conceived both as a threat and an opportunity for more innovative firms, while some firms consider competitive environment a risk that threatens their performance.

There is a possibility that the results of these inconsistent findings are related to the setting of the study itself, whereby most of the previous studies conducted in Western countries showed that environment is a significant moderator in looking at the relationship between various independent variables and performance Some industrial sectors have pointed out that they were facing intense competition in the industry environment, especially in the global market. Large-size foreign owned companies are involved in business operation for international customers employ technology and have the advantages over the global market (Turulja & Bajgoric, 2018). In comparison, the context of this study is related to banking institutions which are highly regulated in Malaysia. This means that banking business activities are controlled by Bank Negara Malaysia through Financial Services Act 2013, which is to allow the regulator taking control over the financial stability in the financial sector by reducing future risks. This increases the protection to customers and promote the stability in the industry. This Financial Services Act 2013 allows the banking institutions was based Malaysia's regulation and supervisory. It ensures that laws governing the conducts of financial institutions are relevant and effective. Hence, this being industry does not affect by the intensity of competitive environment based on highly regulated by Malaysian government.

6.3 Theoretical Contributions

The findings of this study will contribute to the existing knowledge in the areas of business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance of banks in Malaysia. First, data on the business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance of banking institutions in Malaysia shall be compiled and presented. Second, this study shall also provide the empirical test that examines the determinants of a bank's performance in relation to business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment for banks in Malaysia.

This study aims to extend the present knowledge and deliver an integrated model in clarifying the relationships among business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance in banking institutions' environments. It contributes to academic research by giving deeper comprehension into the role of each variable and outlining a framework in which future study of the relationship of performance can be done.

The study also contributes to the field of information management with regard to the practices of business intelligence systems adoption, information technology infrastructure, and innovation, which are of particular significance among banks who are experiencing competitive environmental turbulence. Another theoretical contribution is the conceptual development on the relationship between business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and performance.

This study that has incorporated business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment factors together into one framework with regard to performance. This study contributes to the knowledge-based view, and the application in the knowledge management literature.

This study contributes to the information technology and related literature in a number of ways. First, researchers have long been motivated by the economic significance of information technology in studies (Brynjolfsson & Hitt, 1996; Chen et al., 2015; Karanja, 2011; Loveman, 1994). This study brings closer to an understanding the impact of information technology on performance in banking institutions by investigating the mediating role of innovation in the information technology infrastructure and performance.

Researchers have called for theoretical frameworks that explain how and why information technology infrastructure enhance organisational performance (Karanja, 2011). This study addresses this call by developing a theoretical framework for information technology infrastructure in the context of innovation by specifically aligning the attributes of resource-based theory. The adapted research framework draws from literature to explain from information technology infrastructure in innovation stemming from facilitating coordination and control in the innovation that is required to realize economic benefits in various firm assets and capabilities.

6.4 Managerial Implications

The current study showed that business intelligence systems adoption can be associated directly with their organisational performance and indirectly through innovation. The results of this study show that business intelligence systems adoption among banks promotes innovation among employees which in turn increase their performance. The findings of the current study focus on the practical values of business intelligence systems adoption, information technology infrastructure, and innovation, particularly in performance, alerting the management on issues that need to be concerned with increasing performance.

The results of this study propose promising ideas to be pursued by the management of banking institutions and practitioners. This should be helpful to those involved in policy and decision making in managing information technology, particularly in increasing performance among banks in banking institutions. In this competitive environment, it is highly important for banks to understand the importance of information technology because information has limited worth unless it is applied among employees. Based on the results of this study, it is believed that management of banking institutions in general, should provide adequate support for employees in order to reap maximum benefits from information technology. Therefore, this study highlights several ways through which management can promote organisational performance.

Practically, this study has shown that the adoption of business intelligence systems can increase organisational performance. This has provided an insight to managers and policymakers that in evaluating the effects on an information technology/information study such as business intelligence systems, should take a comprehensive approach and consider aspects due to the intangibility of some of the benefits. In addition, it is recommended that bank managers should also encourage the use of business intelligence systems in all their operations which with time can translate the performance of the organisation. Again, it is highly recommended that the empirical evidence provided through this study should be used by management and other policy makers to help create awareness about business intelligence systems especially in developing countries.

The findings of this study are useful for industrial practitioners and policy makers particularly in terms of designing the development of business intelligence systems adoption for the present and future business intelligence experts in Malaysia. As it is a vital issue in managing business, the knowledge and exposure of these concepts should also be embedded in training programmes. The findings also implicate banking institutions' decision makers by preparing an empirically tested model to understand the effects of the variables on the process of business intelligence better. This helps them to develop excellent strategies in regard to the business model structure to obtain benefits and better organisational performance.

This study has its own implications. First, it has provided understandings on how business intelligence interacted with resources within organisation to increase performance. Business intelligence creates values given the suitable conditions that are coordinated by information technology infrastructure. Thus, business intelligence system must be reviewed as a fragment of a larger picture so that the benefits of business intelligence system are able to be realised.

Business intelligence system contains strategic values that contribute to the swiftness of organisations. It is not fruitful for organisations that invest in the business intelligence system if they do not create a suitable condition for the implementation. Also, this study reminds organisational executives that information technology infrastructure is a strategic component in determining organisational performance, hence focus should be given to many fields of information technology infrastructure in terms of helping to enhance organisational performance.

The results recommended that innovation is a necessity in determining organisational performance and banks must increase their innovativeness in a time of uncertainties and when the business environment is hostile. This study has provided useful information for the policy makers i.e. government to implement effective economic policies and ensure a sustainable economy in the future. It also serves as a guideline to be put into action in order for the banks to survive and improve performance.

Performance is a condition which enables an organisation to operate in a higher quality or more efficient manner than its competitors. The results of this study offer clear guidelines for how business intelligence can be used to improve and facilitate knowledge sharing and organisational innovation and result in positive outcomes that will help firms to achieve organisational performance. The collection of relevant, timely and high-quality information, the dissemination of this information and applying it correctly contribute to the success of organisation in the long term and business intelligence system can be very effective in this regard. Business intelligence helps companies know the sale trends, monitor the customers and their complaints and anticipate customer's behaviour and market's demand. As a result, business intelligence helps the organisation reach fundamental goals such as cost reduction, productivity improvement, innovation and product development, customers service development, income increase, etc. Organisation should invest sufficiently in development and growth of business intelligence systems to convert the recorded raw data into useful information. Making decision and analysing based on the reality of business intelligence influences all the organisational decisions and performance.

The rapid growth of information technology, variety of products in an extremely intensive competitive environment, drastic developments of management theories coupled with the restriction of natural resources and problems of using labour force have made the managers of public and private, large and small, manufacturing and service organisations look for plausible solutions to resolve the problems and maintain survival. The impact of information technology on performance has also attracted some attention. Organisations with high capabilities of information technology can respond to competitive challenges faster than organisations with lower information technology capabilities.

Organisational innovation has a crucial effect on the organisational performance. Innovation as an important issue to people, institutions and overall for all communities, because of its relationship with flexibility and production, is tremendously significant and believe that the crucial factor in the growth and progress of humanity in all fields is innovation and creativity. Accordingly, creativity and innovation are significant factors for the survival of organisation (Wong & Chin, 2007). An organisation which is able to present new and relevant ideas and use them are not reluctant to change, even it can act as a factor to create change in its environment (Tidd & Bessant, 2014).

This study will also assist large firms, investors, governmental sectors, managers and executives, researchers, and students to better understand the relationship between business intelligence systems adoption, information technology infrastructure, innovation, and performance, as well as the impact of competitive environment on innovation and performance.

6.5 Study Limitations and Suggestions for Future Research

Several limitations are worth noting in the present study and the areas that require further attention in future studies. The current study focused on empirically some valuable findings on the relationships between the constructs; business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and the performance. It is also important for the researcher to report the limitations in conducting the current research and suggestions for future research.

First, this study collected the data from bank managers limit the findings of the study. Hence, future research should consider end user approach in order to better understand the benefits and their experience of business intelligence systems adoption and information technology infrastructure and how these technologies assists them in innovation.

Second, the current study only focused on important pillars of information technology infrastructure namely connectivity, compatibility, and modularity. There are also other aspects or pillars of information technology infrastructure such as personnel competency (Byrd et al., 2008; Chanopas et al., 2006; Newman et al., 2014) that can be focused on by future studies in order to increase the understanding of more aspects of information technology infrastructure with regard to innovation and performance. Future research must deeply analyse how organisations can leverage information technology infrastructure that is flexible to maximise the values of these information technology and information study elements to remain on top of the game against their competitors.

Third, the effect of business intelligence systems adoption, information technology infrastructure, innovation, and competitive environment on performance might be different for different industries. For future research, it would be also interesting to know the differences between these different industries that can be related to innovation and performance. In addition, this study only concentrates on banking institutions that belong to the financial sector, which may limit the generalisability of this study. In light of this, a replication of this study should examine performance from other institutions including takaful and insurance companies. One weakness of this study draws attention to the generalisability of the findings. This particular study has been conducted only on banking institutions in Malaysia. It is therefore unclear how these results would generalise the finding beyond the firms in the sample. It is possible that firms focused only on banking institutions may be impacted by industry specific factors such as Bank Negara regulation that may affect the findings. Thus, it is useful for future research to be conducted on other sectors or industries in Malaysia such as servicing, trading, and manufacturing, rather than focusing on one sector such as banking institutions, and to look at the differences between each sectors or industries since the business model is applicable to all types of organisation regardless of their nature of business. It is also beneficial to perform this kind of research on more established firms including public listed companies.

Furthermore, the levels of competitive environmental cannot be established. This study used the techniques of traditional cluster analysis to categorise the competitive environment of the respondents' organisations. A majority of the organisations showed similar competitive environmental characteristics. This study did not segregate the organisations into low and highly competitive environments for a comparison. Despite this omission, the survey did show that competitive environment does not played a vital role on the connections in the research model. It not demonstrated that in highly competitive environments, business intelligence systems adoption, information technology infrastructure, innovation had stronger impacts on performance as compared to in environments with lesser competition. Therefore, future researcher could gather more data from environments with high and low competition to investigate any difference among the relationships.

Future researchers are recommended to weigh business intelligence systems adoption from another viewpoint to examine the use of business intelligence applications in communication and coordination, knowledge management, and workflow and project management. Its effect on business intelligence process and context in various stages of service design could also be investigated. In addition, business intelligence and analytics is highly applied and can leverage opportunities presented by the abundant data and domain-specific analytics needed in many critical and high-impact application areas in organisation. By carefully analysing the application and data characteristics, researchers and practitioners can then adopt or develop the appropriate analytical techniques to derive the intended impact. In addition to technical system implementation, significant business or domain knowledge as well as effective communication skills are needed for the successful completion of such business intelligence and analytics projects.

6.6 Conclusion

In conclusion, this study provides an understanding by integrating business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and the performance among banks manager in Malaysian banking institutions. Specifically, this study examines the business intelligence systems adoption, information technology infrastructure, innovation, competitive environment, and the performance. The current study also clarifies how business intelligence systems adoption and information technology infrastructure directly and indirectly predicts innovation and performance. This research also studies the relationship between innovation and performance as moderation factors of competitive environment. This study applies the knowledge-based view, the RBT to explain the conceptual model. This study also applies contingency theory in understanding competitive environment. Based on these relationships, this study has made several findings; business intelligence systems adoption and information technology infrastructure are found to be positively related to performance, innovation partially mediate between business intelligence systems adoption and performance, and between information technology infrastructure and performance.

However, competitive environment does not moderate the relationship between innovation and performance.

Theoretically, the current study contributes to the body of knowledge by integrating business intelligence systems adoption, information technology infrastructure, and innovation into an integrated framework in order to understand the performance. The study enhanced the knowledge-based view by emphasising the important roles of business intelligence systems adoption in influencing innovation and performance. In addition, it highlights the importance of information technology infrastructure in influencing the innovation and performance. It also added to the knowledge-bases view and RBT the importance of innovation in influencing performance and the need for business intelligence systems adoption and information technology infrastructure as mechanisms in explaining the relationship between both business intelligence systems adoption and performance; and between information technology infrastructure and performance.

This study proposed several practical suggestions to banking institutions on how the banks could utilised their business intelligence systems adoption and information technology infrastructure to innovate and improve performance of the banks. For instance, the management should provide a platform for the employees to enhance their innovativeness through the usage of business intelligence systems adoption and information technology infrastructure. Furthermore, performance can be improved if the management focuses heavily on innovation which could be realised through information technology and information system. This study has some limitations such as its use of collected from bank managers, and its emphasis only on banking institution. Future research should consider multiple informant approaches and comparing industries. The summary of the study is presented in Table 6.2.

Table 6.2:
Summary of the Study

Research Questions	**Research Objectives**	**Findings**	**Contributions**
Does business intelligence systems adoption influence performance?	To examine the relationship between business intelligence systems adoption and performance.	Supported	Concept of business intelligence using the knowledge-based view of business intelligence in understanding performance.
Does information technology infrastructure influence performance?	To examine the relationship between information technology infrastructure and performance.	Supported	Concept of information study literature by incorporating information technology is based on infrastructure provided.
Does innovation mediate the relationship between business intelligence systems adoption and performance?	To examine the mediation effect of innovation on the relationship between business intelligence systems adoption and performance.	Supported	Confirmed a partial mediation of innovation between business intelligence systems adoption and performance using the resource-based view of innovation and the knowledge-based view of business intelligence systems adoption.
Does innovation mediate the relationship information technology	To examine the mediation effect of innovation on information technology	Supported	Confirmed a partial mediation of innovation between information technology infrastructure and performance using the

infrastructure and performance?	infrastructure and performance.		resource-based view of innovation and information technology infrastructure.
Does competitive environment moderate the relationship between innovation and performance?	To examine the moderating effect of competitive environment on innovation and performance.	Not Supported	Competitive environment does not moderate the relationship between innovation and performance.

REFERENCES

Al-Quran

Abramowsky, L., Griffith, R. (2006). Outsourcing and offshoring of business services: How important is ICT? *Journal of the European Economic Association*, 4(2-3), 594–601.

Abd Aziz, Norzalita, & Mohd Yassin, Norjaya. (2010). Analysing the brand equity and resonance of banking services: Malaysia consumer perspective. *International Journal of Marketing Studies*, 2(2), 180-189.

Acock, A. C. (2005). Working with missing values. *Journal of Marriage and Family*, *67*(4), 1012-1028.

Acs, Z. J., & Audretsch, D. B. (1989). Patents as a measure of innovative activity. *Kyklos*, 4 2 (2), 171–180.

Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measurement: A review. *International Journal of Management Reviews*, *8*(1), 21-47.

Addicott, R., McGivern, G., & Ferlie, E. (2006). Networks, organizational learning and knowledge management: NHS cancer networks. *Public Money and Management*, *26*(2), 87-94.

Aghaei, M., & Asadollahi, A. (2013). Analysis of business intelligence on strategic decision making. *International Journal of Scientific Management and Development.* Vol.2 (1), 20-35, November (2013): 20-34.

Aghion, P., and Howitt, P.W. (1992). A model of growth through creative destruction. *Econometrica,* 60(2): 323-51.

Ahuja, G., & Katila, R. (2001). Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study. *Strategic Management Journal*, 2 2 (3), 197-220.

Akbaba, A. (2006). Measuring service quality in the hotel industry: A study in a business hotel in Turkey. *International Journal of Hospitality Management*, *25*(2), 170-192.

Akgün, A. E., Ince, H., Imamoglu, S. Z., Keskin, H., & Kocoglu, İ. (2014). The mediator role of learning capability and business innovativeness between total quality management and financial performance. *International Journal of Production Research*, *52*(3), 888-901.

Alam, I. & Perry, C. (2002). A customer-oriented new service development process. *Journal of Services Marketing*, 16(6), 515-534.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, 107-136.

Albright, S. C., W.L. Winston & C. Zappe (2003). *Data analysis and decision making with Microsoft excel*. United States of America: Thomson Learning.

Alegre, J., & Chiva, R. (2013). Linking entrepreneurial orientation and firm performance: The role of organizational learning capability and innovation performance. *Journal of Small Business Management*, *51*(4), 491-507.

Al-Laham, A., Schweizer, L., & Amburgey, T. L. (2010). Dating before marriage? Analyzing the influence of pre-acquisition experience and target familiarity on acquisition success in the “M&A as R&D” type of acquisition. *Scandinavian Journal of Management*, *26*(1), 25-37.

Al-Mansour AH (2007). Application of TQM to financial services. http://faculty.kfupm.edu.sa/CEM/bushait/cem515/term-papers/TQM-Finance.pdf

Alpar, P., & Kim, M. (1990). A microeconomic approach to the measurement of information technology value. *Journal of Management Information Systems*, *7*(2), 55-69.

Al-Swidi, A.K. & Mahmood, R. (2011). How does organizational culture shape the relationship between entrepreneurial orientation and the organizational performance of banks? *European Journal of Social Sciences*, 20(1), 28-46.

Al-Swidi, A. K., & Al-Hosam, A. (2012). The effect of entrepreneurial orientation on the organizational performance: A study on the Islamic banks in Yemen using the Partial Least Squares approach. *African Journal of Business Management*, *2*(1), 73–84. doi:10.12816/0002244

Alter, A. (2004). A work system view of DSS in its fourth decade. *Decision Support Systems*, 38 (3), 319-327.

Amabile, T.M., Conti R., Coon, H., Lazenby J., & Herron, M., (1996). Assessing the work environment for creativity. *Academy of Management Journal*, Vol. 39: 54-84.

Ambad, S. N. A (2014). *Corporate entrepreneurship as a determinant of large firm performance: Evidence from Malaysia* (Doctoral dissertation). Universiti Sains Islam Malaysia.

Ambad, S. N. A., & Wahab, K. A. (2013). Entrepreneurial orientation among large firms in Malaysia: Contingent effects of hostile environments. *International Journal of Business and Social Science*, *4*(16).

Amit, R. & P. J. H. Schoemaker. (1993). Strategic Assets and Organizational Rent. *Strategic Management Journal*. Vol. 14: p. 33-46.

Amran, A., Lynn Ling, L., & Sofri, Y. (2007). A study of corporate philanthropic traits among major Malaysian corporations. *Social Responsibility Journal*, *3*(4), 21-30.

Anderson, J. and Gerbing, D. (1988). Structural Equation Modelling in practice: A review and recommended two-step approach. *Psychological Bulletin*, (103:3), pp. 411-23.

Anning-Dorson, T. (2017). How much and when to innovate: The nexus of environmental pressures, innovation and service firm performance. *European Journal of Innovation Management*, *20*(4), 599-619.

Ansir Ali Rajput. (2011). Impact of Innovation and Resources in Entrepreneurial Success: A case study of Pakistani SMEs. *Interdisciplinary Journal of Contemporary Research in Business* 2, 606-636.

Antony, J. P, & Bhattacharyya, S. (2010). Measuring organizational performance and organizational excellence of SMEs – Part 2: An empirical study on SMEs in India. *Measuring Business Excellence*, 14(3), 42-52.

Aral, S., & Weill, P. (2007). IT assets, organizational capabilities, and firm performance: How resource allocations and organizational differences explain performance variation. *Organization Science*, *18*(5), 763-780.

Arias Aranda, D., & Molina-Fernández, L. M. (2002). Determinants of innovation through a knowledge-based theory lens. *Industrial Management & Data Systems*, *102*(5), 289-296.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 396-402.

Armstrong, C. P. and Sambamurthy, V. (1999). Information technology assimilation in firms: the influence of senior leadership and IT infrastructures, *MIS Quarterly*, 104 304-327.

Arthur, W. (1996). Increasing returns and the new world of business. *Harvard Business Review*, 100-109.

Aruldoss, M., Lakshmi Travis, M., & Prasanna Venkatesan, V. (2014). A survey on recent research in business intelligence. *Journal of Enterprise Information Management*, 27(6), 831-866.

Atkinson, P. & Hammersley, M. (1994). *Ethnography and participant observation*. In Denzin, N. K. and Lincoln, Y. S. (eds.) Handbook of qualitative research. Thousand Oaks: Sage Publications Inc.

Atuahene-Gima, K. (1996). Differential potency of factors affecting innovation performance in manufacturing and services firms in Australia. *Journal of Product Innovation Management*, 13(1), 35-52.

Atuahene-Gima, K. (2005). Resolving the capability–rigidity paradox in new product innovation. *Journal of Marketing*, *69*(4), 61-83.

Augusto, M., & Coelho, F. (2009). Market orientation and new-to-the-world products: Exploring the moderating effects of innovativeness, competitive strength, and environmental forces. *Industrial Marketing Management*, *38*(1), 94-108.

Avlonitis, G.J., Papastathopoulou, P. G. & Gounaris, S.P. (2001). An empirically based typology of product innovativeness for new financial services: Success and failure scenarios. *Journal of Product Innovation Management*, 18(5), 324-342.

Azma, F., & Mostafapour, M. A. (2012). Business intelligence as a key strategy for development organizations. *Procedia Technology*, *1*, 102-106.

Azvine, B., Cui, Z., Nauck, D. D., & Majeed, B. (2006). Real time business intelligence for the adaptive enterprise. In *The 8th IEEE International Conference on E-Commerce Technology and the 3rd IEEE International Conference on Enterprise Computing, E-Commerce, and E-Services (CEC/EEE'06)* (pp. 29-29). IEEE.

Babbie, E. (1990). *Survey research method*. Belmont, CA: Wadsworth.

Badr, A., Madden, E., & Wright, S. (2006). The contribution of CI to the strategic decision-making process: Empirical study of the European pharmaceutical industry.

Baer, M., & Frese, M. (2003). Innovation is not enough: Climates for initiative and psychological safety, process innovations, and firm performance. *Journal of Organizational Behaviour*, *24*(1), 45-68.

Bakar, M.S. (2014), *The mediating effect of intrapreneurial orientation on the relationship between leadership style, knowledge sharing behaviour and performance of academic leaders in Malaysia* (Doctoral dissertation). Universiti Utara Malaysia.

Baker, W. E., & Sinkula, J. M. (1999). The synergistic effect of market orientation and learning orientation on organizational performance. *Journal of the Academy of Marketing Science*, *27*(4), 411-427.

Bani, J. (2011). *Assessing the relationships among information technology flexibility, IT-*

business strategic alignment, and information technology effectiveness: An investigation of business intelligence implementation (Doctoral dissertation). Capella University.

Banu Goktan, A., & Miles, G. (2011). Innovation speed and radicalness: Are they inversely related? *Management Decision*, *49*(4), 533-547.

Barclay, D., C. Higgins & R. Thompson. (1995). The Partial Least Squares (PLS) Approach to Causal Modelling: Personal Computer Adoption and Use as an Illustration (Special Issue on Research Methodology). *Technology Studies*, Vol. 2. (2): p. 285–309.

Barczak, G. (1995). New product strategy, structure, process and performance in the telecommunication industry. *Journal of Product Innovation Management*, 12(3), 224-234.

Bardhan, A., & Jaffe, D. (2005). *Innovation, R&D and Offshoring*. Fisher Centre for Real Estate and Urban Economics, University of California, Berkeley.

Baregheh, A., Rowley, J., & Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management Decision*, *47*(8), 1323-1339.

Barnet, V. & Lewis, T. (1994). *Outliers in statistical data*. John Wiley, ISBN 0-471-93094-6, Chichester.

Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management Science*, *32*(10), 1231-1241.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*. 17: 99-120.

Barney, J. (2001). Resource-Based Theories of Competitive Advantage: A Ten-Year Retrospective on the Resource-Based View. *Journal of Management,* Vol. 27: p.643– 650.

Barney, J. (2011). *Gaining and Sustaining Competitive Advantage* (4th ed.). New Jersey: Pearson Education.

Baron RM, & Kenny D.A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal Personal Social Psychology*, 51(6): 1173- 1182.

Barrett, H., & Weinstein, A. (1998). *The effect of marketing orientation and organizational flexibility on corporate entrepreneurship*. Entrepreneurship: Theory & Practice, 23(Fall), 57-70.

Barua, A., Kriebel, C. H., & Mukhopadhyay, T. (1995). Information technologies and business value: An analytic and empirical investigation. *Information System Research*, 6 (1), 3-23.

Bates, R., & Khasawneh, S. (2005). Organizational learning culture, learning transfer climate and perceived innovation in Jordanian organizations. *International Journal of Training and Development*, *9*(2), 96-109.

Beik Zadeh, J., & Eskandari, K. (2009). Competitive Intelligence as a tool to support managers in decision-making processes. *Journal of Management*, No. 20, pp. 47-51.

Bergeron, P., & Hiller, C. A. (2002). Competitive intelligence. *Annual Review of Information Science and Technology (Arist)*, *36*, 353-90.

Bergeron, P. and Hiller, C.A. (2002). Competitive intelligence. Annual Review of Information Science And Technology, Vol. 36, pp. 353-390.

Berry, L.L., Shankar, V., Parish, J.T., Cadwallader, S. & Dotzel, T. (2006). Creating new markets through service innovation. *Sloan Management Review*, 47(2), 56-63.

Bessen, J. E. (2006). *The value of U.S. patents by owner and patent characteristics* (Working Paper, No. 06-46). Boston: Boston University.

Bessant, J. (2005). Enabling continuous and discontinuous innovation: Learning from the private sector. *Public Money and Management*, *25*(1), 35-42.

Bharadwaj, A. (2000). A Resource-Based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quarterly*, 24, 169-196.

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information technology effects on firm performance as measured by Tobin's q. *Management Science*, *45*(7), 1008-1024.

Bhatt, G. D., & Grover, V. (2005). Types of information technology capabilities and their role in competitive advantage: An empirical study. *Journal of Management Information Systems*, *22*(2), 253-277.

Black, D. H., & Synan, C. D. (1997). The learning organisation: the sixth discipline? *Management Accounting: Magazine for Chartered Management Accountants*, *75*(10), 70-72.

Blazevic, V. & Lievens, A. (2004). Learning during the new financial service innovation process: antecedents and performance effects. *Journal of Business Research*, 57(4), 374-391.

Blazevic, V., Lievens, A. & Klein, E. (2003). Antecedents of project learning and time-to-market during new mobile service development. *International Journal of Service Industry Management*, 14(1), 120-147.

Blinder, A. S. (2006). Offshoring: the next industrial revolution? *Foreign Affairs*, 113-128.

Blodgett A. (2004). *The interaction of prosodic phrasing, verb bias, and plausibility during spoken sentence comprehension* (Doctoral dissertation). Columbus: The Ohio State University.

Bontis, N. (2002). *Intellectual capital: an exploratory study that develops measures and models*. In C.W. Choo & N. Bontis (eds). The strategic management of intellectual capital and organizational knowledge. New York: Oxford University Press.

Bose, R. (2008). Competitive intelligence process and tools for intelligence analysis. *Industrial Management and Data Systems*, *108*(4), 510-528.

Bose, I., & Mahapatra, R. K. (2001). Business data mining - a machine learning perspective. *Information and Management*, *39*(3), 211-225.

Bourgeois, L. J. (1980). Strategy and environment: A conceptual integration. *Academy of Management Review*, *5*(1), 25-39.

Bourgeois III, L. J., & Eisenhardt, K. M. (1988). Strategic decision processes in high velocity environments: Four cases in the microcomputer industry. *Management Science*, *34*(7), 816-835.

Boyd, B.K., Dess, G.G., & Rasheed, A.M (1993). Divergence between archival and perceptual measures of the environment: Causes and consequences. *Academy of Management Review*, 18, 204-226.

Boyne, G. A., & Meier, K. J. (2009). Environmental turbulence, organizational stability, and public service performance. *Administration and Society*, *40*(8), 799-824.

Bradshaw, P. (2009). A Contingency approach to non-profit governance. Non-profit Management & Leadership. Vol. 20. (1): p. 61-81.

Bray, M. (2008). *Middleware*. Software Engineering Institute - Carnegie Mellon. Retrieved from http://www.sei.cmu.edu/str/descriptions/middleware.html

Brazeal, D. V. (1993). Organizing for internally developed corporate ventures. *Journal of Business Venturing*, *8*(1), 75-90.

Bresman, H., Birkenshaw, J., & Nobel, R. (1999). Knowledge transfer in international acquisitions. *Journal of International Business Studies*, 30 ,439–462

Broadbent, M., & Weill, P. (1997). Management by maxim: how business and IT managers can create IT infrastructures. *Sloan Management Review*, *38*, 77-92.

Broadbent, M., Weill, P., O'Brian & Neo. (1996). Firm context and patterns of IT infrastructure capability, ICIS Proceedings, Cleveland, 1996:174-194.

Brown, H. G. (2007). *Ending the French revolution: Violence, justice, and repression from the terror to Napoleon*. University of Virginia Press.

Brown, S. L., & Eisenhardt, K. M. (1998). *Competing on the edge: Strategy as structured chaos*. Boston: Harvard Business School Press.

Brudney, J. L. &V. Murray. (1997). Improving non-profit boards: What works and what doesn't. *Non-profit World*. Vol. 15. (3): p. 11-17.

Bruno, C., & Reinhilde, V. (2006). In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisitions. *Management Science*, 5 2(1), 68-82.

Bryman, A. (2008). Why do researchers integrate/combine/mesh/blend/mix/merge/fuse quantitative and qualitative research? *Advances in Mixed Methods Research*, 87-100.

Bryman, A., & Cramer, D. (1990). *Quantitative data analysis for social scientists*. Taylor & Frances/Routledge.

Brynjolfsson, E. (1993). The productivity paradox of information technology. *Communications of the ACM*, *36*(12), 66-77.

Brynjolfsson, E., & Hitt, L. (1995). Information technology as a factor of production: The role of differences among firms. *Economics of Innovation and New Technology*, *3*(3-4), 183-200.

Brynjolfsson, E. & Hitt, L., (1996). Paradox lost? Firm-level evidence on the returns to information systems spending. *Management Science,* 42(4), 541-558.

Brynjolfsson, E., & Schrage, M. (2009). The new, faster face of innovation. *The Wall Street Journal*.

Bunyaratavej, K., Hahn, E. D., & Doh, J. P. (2007). International offshoring of services: A parity study. *Journal of International Management*, *13*(1), 7-21.

Burjatzky, F. (2007). Walden University, 146. http://doi.org/UMI : 3257958

Burns, T., & G. Stalker. (1961). The Management of Innovation. Chicago: Quandrangle Books.

Burton, B. & Hostmann, B. (2005). *Findings from Sydney symposium: Perceptions of business intelligence*. Retrieved from Gartner database.

Burton-Jones, A. & Straub, Jr. D. W. (2006). Reconceptualizing system usage: An approach and empirical test. *Information Systems Research*, 17(3), 228-246.

Byrd, T.A. (2001). Information Technology, Core Competencies and Sustained Competitive Advantage. *Information Resources Management Journal*, (14:2), pp. 27-36.

Byrd, T. A., & Davidson, N. W. (2006). An empirical examination of a process-oriented IT business success model. *Information Technology and Management*, *7*(2), 55–69.

Byrd, T. A., & Marshall, T. E. (1997). Relating information technology investment to organizational performance: A causal model analysis. *OMEGA International Journal of Management Science*, 25(1), 43-56.

Byrd, T. A., & Turner, D.E. (2000). Measuring the flexibility of IT infrastructure: Exploratory analysis of a construct. *Journal of Management Information Systems*, 17(1), 167-208.

Byrd T. A. and Turner, D. E. (2001). An Exploratory Examination of the relationship between flexible IT infrastructure and competitive advantage. *Information & Management*, (39:1), pp. 41-52.

Byrd, T. A., Pitts, J., Adrian, A., & Davidson, N. W. (2008). Examination of a path model relating IT infrastructure with firm performance. *Journal of Business Logistics*, 29(2), 161-187.

Calantone, R.J., Cavusgil, S.T., & Zhao, Y. (2002). Learning Orientation, Firm Innovation Capability, and Firm Performance. *Industrial Marketing Management*, 2002, Vol. 31: 515-524.

Camisón, C., & Villar-López, A. (2014). Organizational innovation as an enabler of technological innovation capabilities and firm performance. *Journal of Business Research*, *67*(1), 2891-2902.

Campbell, J. P. (1977). On the nature of organizational effectiveness. In P.S. Goodman, J. M. Pennings, & Associates (Eds.), *New perspectives on organizational Effectiveness*, (pp. 13-55). San Francisco: Jossey-Bass.

Cappel, J. J., & Boone, J. P. (1995). A look at the link between competitive intelligence and performance. *Competitive Intelligence Review*, *6*(2), 15-23.

Carmeli, A. (2001). High-and low-performance firms: Do they have different profiles of perceived core intangible resources and business environment? *Technovation*, *21*(10), 661-671.

Carden, S. D. (2005). What global executives think about growth and risk? *McKinsey Quarterly*, 2, 16–25.

Casado, E. (2004). Expanding business intelligence power with system dynamics. In *Business intelligence in the Digital Economy: Opportunities, Limitations and Risks* (pp. 126-140). IGI Global.

Cavana, R.Y., B.L. Delahaye, & U. Sekaran. (2001). *Applied Business Research: Qualitative and Quantitative Methods*. Singapore: John Wiley & Sons.

Cefis, E. and Marsili, O., (2003). *Survivor: The role of innovation in firms' survival*. E.A.R.I.E. 2004 Conference Paper, DIW Berlin.

Cefis, E., & Marsili, O. (2012). Going, going, gone. Exit forms and the innovative capabilities of firms. *Research Policy*, *41*(5), 795-807.

Cetorelli, N. (1999). Competitive Analysis in Banking: Appraisal of the Methodologies, *Economic Perspectives*, 23(1), 2-15.

Campbell, J. P. (1977). On the Nature of Organizational Effectiveness. *New Perspectives on Organizational Effectiveness*, *13*, 55.

Chang, E., Hussain, F., & Dillon, T. (2006). *Trust and reputation for service-oriented environments: Technologies for building business intelligence and consumer confidence*. John Wiley & Sons.

Chanopas, A., Krairit, D., and Khang, D.B. (2006). Managing IT infrastructure: A New Flexibility Framework. *Management Research News*, (29:10), pp. 632- 651.

Chari, M. D., Devaraj, S., & David, P. (2008). Research note - The impact of information technology investments and diversification strategies on firm performance. *Management Science*, *54*(1), 224-234.

Chatzoglou, P., & Chatzoudes, D. (2018). The role of innovation in building competitive advantages: An empirical investigation. *European Journal of Innovation Management*, *21*(1), 44-69.

Chen, X. (2012). *Impact of business intelligence and IT infrastructure flexibility on competitive advantage: An organizational agility perspective* (Doctoral dissertation). University of Nebraska.

Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business Intelligence and Analytics. *MIS Quarterly*, *36*(4), 1165–1188.

Chen, X., & Siau, K. (2012). Effect of business intelligence and IT infrastructure flexibility on organizational agility. *Knowledge Management and Business Intelligence,* 1-11.

Chen, R., Sun, C., Helms, M., & Jih, W. (2009). Factors influencing information system flexibility: An interpretive flexibility perspective. *International Journal of Enterprise Information Systems*, 5(1), 32-43.

Chen, Y., Wang, Y., Nevo, S., Benitez-Amado, J., & Kou, G. (2015). IT capabilities and product innovation performance: The roles of corporate entrepreneurship and competitive intensity. *Information & Management*, *52*(6), 643-657.

Cheng, H., Lu, Y. C., & Sheu, C. (2009). An ontology-based business intelligence application in a financial knowledge management system. *Expert Systems with Applications*, *36*(2), 3614-3622.

Chesbrough, H., Vanhaverbeke, W., & West, J. (Eds.). (2006). *Open Innovation: Researching a New Paradigm*. Oxford: Oxford University Press.

Cheung, M., Myers, M., & Mentzer, J. (2010). Does relationship learning lead to relationship value? A cross-national supply chain investigation. *Journal of Operations Management, 28*(6), 472-487.

Child, J., L. Chung & H. Davies. (2003). The performance of cross-border units in china: A test of natural selection, strategic choice and contingency theories. *Journal of International Business Studies*. Vol. 34: p. 242–254.

Chin, W. W. (1998). Commentary: *Issues and opinion on structural equation modelling*.

Chin, W. W. (2010). Chapter 28: *How to write up and report PLS analyses*. In Vinzi, V.E., W. W. Chin, J. Henseler & H. Wang (Eds.), Handbook of Partial Least Squares: Concepts, Methods and Applications (p. 355-690): Springer.

Chin, W. W. & P. R. Newsted. (1999). Structural Equation Modelling Analysis with small samples using Partial Least Squares. Statistical Strategies for small sample research. R. H. Hoyle. Thousand Oaks, CA, *Sage Publications*: 307-341.

Chintrakarn, P. (2008). Estimating the euro effects on trade with propensity score matching. *Review of International Economics*, *16*(1), 186-198.

Chua, W. F. (1986). Radical developments in accounting thought. *Accounting review*, 601-632.

Chuang, S. H. (2004). A resource-based perspective on knowledge management capability and competitive advantage: an empirical investigation. *Expert Systems with Applications*, *27*(3), 459-465.

Chung, K., & Pruitt, S. (1994). A simple approximation of Tobin's q. *Financial Management*, 23 (3), 70-74.

Chung, S. H., Rainer Jr, R. K., & Lewis, B. R. (2003). The impact of information technology infrastructure flexibility on strategic alignment and application implementations. *Communications of the Association for Information Systems*, *11*(1), 11.

Chung W., Zhang, Y., Huang, Z., Wang, G., Ong, T. and Chen H. (2004). Internet searching and browsing in a multilingual world: An experiment on the Chinese business intelligence portal (CbizPort). *Journal of the American Society for Information Science and Technology*, 55 (9), 818-831.

Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 64-73.

Chyi Lee, C., & Yang, J. (2000). Knowledge value chain. *Journal of management Development*, *19*(9), 783-794.

Claver-Cortés, E., Pertusa-Ortega, E. M., & Molina-Azorín, J. F. (2012). Characteristics of organizational structure relating to hybrid competitive strategy: Implications for performance. *Journal of Business Research*, *65*(7), 993-1002.

Coakes, S. J., & Steed, L. G. (2003). Multiple response and multiple dichotomy analysis. *SPSS: analysis without anguish: Version 11.0 for Windows*, 215-224.

Coakes, S. J. & L. Steed. (2007). *SPSS: Analysis Without Anguish: Version 14.0 for Windows*. Milton, Qld: John Wiley & Sons.

Cohen, J. (1988). Statistical power analyses for the social sciences. *Hillsdale, NJ, Lawrence Erlbauni Associates*.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cohen, J. & P. Cohen. (1983). *Applied Multiple Regression/Correlation Analysis for the Behavioural Sciences* (2nd Edition ed.). Hillsdale, NJ: Erlbaum.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioural sciences* (3rd ed.). Mahwah, NJ: Erlbaum.

Conner, K. R., & Prahalad, C. K. (1996). A resource-based theory of the firm: Knowledge versus opportunism. *Organization Science*, *7*(5), 477-501.

Cooper, J. R. (1998). A multidimensional approach to the adoption of innovation. *Management Decision*, *36*(8), 493-502.

Cooper, D.R. & Schindler, P.S. (2003). *Business Research Methods* (Eighth ed.) Boston, MA: McGraw-Hill.

Cooper, D.R. & Schindler, P.S. (2006). *Business Research Method*. New York: McGraw Hill.

Corso, M., & Paolucci, E. (2001). Fostering innovation and knowledge transfer in product development through information technology. *International Journal of Technology Management*, *22*(1-3), 126-148.

Covin, J. G., & Miles, M. P. (1999). Corporate entrepreneurship and the pursuit of competitive advantage. *Entrepreneurship: Theory and practice*, *23*(3), 47-47.

Covin, J. & D. Slevin. (1989). Strategic Management of Small Firms in Hostile and Benign Environments. *Strategic Management Journa*l. Vol. 10: p. 75-87.

Crawford, M. C. & Di Benedetto, A. (2002). *New Product Management*, 7th edition, Boston, MA: McGraw Hill.

Creswell, J.W. (2003) *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd edition). Thousand Oaks, CA: Sage.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Cronin, B., & Crawford, H. (1999a). Information warfare: Its application in military and civilian contexts. *The Information Society,* 15, 257-263.

Cronin, B., & Crawford, H. (1999b). Raising the intelligence stakes: Corporate information warfare and strategic surprise. *Competitive Intelligence Review,*10(3), 58-66.

Croteau, A. M., & Bergeron, F. (2001). An information technology trilogy: business strategy, technological deployment and organizational performance. *The Journal of Strategic Information Systems*, *10*(2), 77-99.

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Sage.

Cuyvers, L., Dumont, M., Viviers, W., De Pelsmacker, P., Muller, M. L., Jegers, M., & Saayman, A. (2008). Export intensity and the competitive intelligence of exporting companies: Evidence from South Africa. *South African Journal of Economic and Management Sciences*, *11*(1), 85-97.

Daft, R. L. (1978). A dual-core model of organizational innovation. *Academy of Management Journal*, 21(2), 193-210.

Daft, R. L. (1983). *Organization theory and design*. New York: West.

Daft, R.L. (1992), *Organization theory and design*, West Publishing Company, St. Paul.

Daft, R.L. (2006). *Organization theory and design*. Cengage learning.

Daft, R. L., & Becker, S. W. (1978). The innovative organization. *NY: Elsevier*.

Daft, R. L., J. Sormunen & D. Park. (1988). Chief Executive scanning, al characteristics, and company performance: An empirical study. *Strategic Management Journal*. Vol. 9. (2): p. 123-139.

Dainty, A. (2008). Methodological pluralism in construction management research. *Advanced Research Methods in the Built Environment*, *1*, 1-13.

Damanpour, F. (1987). The adoption of technological, administrative and ancillary innovation-impact of organizational factors. *Journal of Management*, 13(4), pp. 675-688.

Damanpour, F. (1991). Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators, *Academy of Management Journal*, Vol. 34 No.3, pp. 555-90 Duncan 1995.

Damanpour, F. (1992). Organizational size and innovation. *Organization Studies*, 13(3), 375.

Damanpour, F. (1996). Organizational complexity and innovation: Developing and testing multiple contingency models. *Management Science*, *42*(5), 693-716.

Damanpour, F., & Evan, W. M. (1984). Organizational innovation and performance: The problem of "organizational lag". *Administrative Science Quarterly*, 392-409.

Damanpour, F., & Schneider, M. (2006). Phases of the adoption of innovation in organizations: effects of environment, organization and top managers 1. *British Journal of Management*, *17*(3), 215-236.

Damanpour, F., Szabat, K. A., & Evan, W. M. (1989). The relationship between types of innovation and organizational performance. *Journal of Management Studies*, *26*(6), 587-602

Davenport, T. H. (1993). *Process innovation: Reengineering work through information technology*. Harvard Business Press.

Davenport, T. H. (2006). Competing on analytics. *Harvard Business Review*, *84*(1), 98.

Davenport, T., & Linder, J. (1994). Information Management Infrastructure: the new competitive weapon? In *HICSS (4)* (pp. 885-896).

Davenport, T.H. & Prusak, L. (1998) *Working Knowledge: How organizations manage what they know.* Boston: Harvard Business School Press.

Davenport, T. H., & Short, J. E. (1990). *The new industrial engineering: Information technology and business process redesign*.

Davern, M. J., & Kauffman, R. J. (2000). Discovering potential and realizing value from information technology investments. *Journal of Management Information Systems*, *16*(4), 121-143.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, And User Acceptance of Information Technology. *MIS Quarterly*, 319-340.

Dawes, J. (2008). Do data characteristics change according to the number of scale points used? An experiment using 5-point, 7-point and 10-point scales. *International Journal of Market Research*, *50*(1), 61-104.

Dawson, L., & Van Belle, J. P. (2013). Critical success factors in South African business intelligence projects in the insurance industry. In Refereed *Proceedings Knowledge Management Conference June 26-28, 2013 Novi Sad, Serbia* (p. 65).

Decrop, A. (1999). Qualitative research methods for the study of tourist behaviour. *Consumer Behaviour in Travel and Tourism*, 335-365.

Dehning, B., & Stratopoulos, T. (2002). DuPont analysis of an IT-enabled competitive advantage. *International Journal of Accounting Information Systems*, *3*(3), 165-176.

Del Canto, J. G., & Gonzalez, I. S. (1999). A resource-based analysis of the factors determining a firm's R&D activities. *Research Policy*, 28(S), 891-905.

Deloitte (2004) *Employers Cite Rising Costs, Promoting Consumerism as Top Priorities for Benefit Plans in 2004*, URL: http://www.deloitte.com/dtt/press_release/0,2309,sid%253D2283%2526cid%253D38676,00.html,

De Mel, S., McKenzie, D., & Woodruff, C. (2009). *Innovative firms or innovative owners? Determinants of innovation in micro, small, and medium enterprises*. The World Bank.

Demirbag M. T., Tatoglu, E., Tekinus, M., & Zaim, S. (2006). An analysis of the relationship between TQM implementation and organizational performance: evidence from Turkish SMEs. *Journal of Manufacturing Technology Management*, 17(6), 829-847.

Demirhan, D., Jacob, V. & Raghunathan, S. (2006). Information technology investment strategies under declining technology cost. *Journal of Management Information Systems*, 22(3), 321-350.

Denzin, N. K., & Lincoln, Y. S. (1998). *The landscape of qualitative research: Theories and issues* (pp. 221-259). Thousand Oaks, CA: Sage.

Department of Trade and Industry. (2003). Social enterprise: A progress report on social enterprise. UK: Department of Trade and Industry. http://www.dti.gov.uk

Deshpandé, R., Farley, J. U., & Webster Jr, F. E. (1993). Corporate culture, customer orientation, and innovativeness in Japanese firms: A quadrat analysis. *The Journal of Marketing*, 23-37.

Dess, G.G. & Beard, D.W. (1984). Dimensions of Organizational Task Environments, *Administrative Science Quarterly*, (29:1), pp. 52-73.

Dess, G. G., & Robinson, R. B. (1984). Measuring organizational performance in the absence of objective measures: The case of the privately held firm and conglomerate business unit. *Strategic Management Journal*, *5*(3), 265-273.

Dess, G. G., Lumpkin, G. T., & Covin, J. G. (1997). Entrepreneurial strategy making and firm performance: Tests of contingency and configurational models. *Strategic Management Journal*, *18*(9), 677-695.

Dess, G. G., R. D. Ireland & M. A. Hitt (1990). Industry Effect and Strategic Management Research, *Journal of Management*, 16, pp. 7-27.

Dess, G. G., Lumpkin, G. T., & McGee, J. E. (1999). Linking corporate entrepreneurship to strategy, structure, and process: Suggested research directions. *Entrepreneurship Theory and Practice*, 24(1), 85- 102.

Devaraj, S., & Kohli, R. (2003). Performance impacts of information technology: Is actual usage the missing link? *Management Science*, *49*(3), 273-289.

Devinney, T. M. (1993). How well do patents measure new product activity? *Economic Letters*, 4 1 (4), 447-450.

Dewett, T., & Jones, G. R. (2001). The role of information technology in the organization: A review, model, and assessment. *Journal of Management*, *27*(3), 313-346.

Diamantopoulos, A., & Siguaw, J. A. (2006). Formative versus reflective indicators in organizational measure development: A comparison and empirical illustration. *British Journal of Management*, *17*(4), 263-282.

Dibrell, C., Craig, J. B., & Neubaum, D. O. (2014). Linking the formal strategic planning process, planning flexibility, and innovativeness to firm performance. *Journal of Business Research*, *67*(9), 2000-2007.

Dill, W. R. (1958). Environment as an influence on managerial autonomy. *Administrative Science Quarterly*, 409-443.

Donaldson, L. (2001). *The contingency theory of organizations*. Thousand Oaks, CA, Sage.

Dorson, T. A. (2018). Innovation and competitive advantage creation. *International Marketing Review, 35*(4), 580–600.

Dosi, G. (1988). Sources, procedures and microeconomic effects of innovation. *Journal of Economic Literature*, 26, 1120–1171

Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 313-327.

Duncan, N. (1995). Capturing flexibility of IT infrastructure: A study of resource characteristics and their measure. *Journal of Management Information System*, (12:2), pp. 37-57.

Dunn, G., Everitt, B. S., & Pickles, A. (1993). *Modelling covariances and latent variables using EQS*. CRC Press.

Du Plessis, M. (2007). The role of knowledge management in innovation. *Journal of Knowledge Management*, *11*(4), 20-29.

Duysters, G., & Hagedoorn, J. (2001). Do company strategies and structures converge in global markets? Evidence from the computer industry. *Journal of International Business Studies*, 3 2 (2),347–356.

Du Toit, A. S. (2003). Competitive intelligence in the knowledge economy: what is in it for South African manufacturing enterprises? *International Journal of Information Management*, *23*(2), 111-120.

Dwairi, M.A. (2004). *The moderating roles of national culture and the country institutional profiles on the effect of market orientation and entrepreneurial orientation on the performance of banks in Jordan* (Doctoral dissertation). Louisiana Tech University, US.

Earl, M. J. (1989). *Management strategies for information technology*. Prentice-Hall, Inc.

Easingwood, C. J. (1986). New product development for services companies. *Journal of Product Innovation Management* (4), 264-275.

Eckerson, W. (2003). Smart companies in the 21st century: The secrets of creating successful business intelligence solutions. *TDWI The Data Warehousing Institute Report Series*, 1- 35. Retrieved from http://www.tdwi.org.

Edwards, K. L., & Gordon, T. J. (1984). *Characterization of innovations introduced on the US market in 1982*. Futures Group; Reproduced by Ntis.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 1105-1121.

Elbashir, M. Z., Collier, P. A., & Davern, M. J. (2008). Measuring the effects of business intelligence systems: The relationship between business process and organizational performance. *International Journal of Accounting Information Systems*, *9*(3), 135–153. doi:10.1016/j.accinf.2008.03.001

Elbashir, M.Z., Collier, P.A., & Sutton, S.G. (2011). The role of organizational absorptive capacity in strategic use of business intelligence to support integrated management control systems, *The Accounting Review,* (86:1), pp. 155-184.

El Sawy, O.A. & Pavlou, P.A. (2008). IT-Enabled business capabilities for turbulent environments. *MIS Quarterly Executive* (7:3), pp. 139-150.

Emmerich, W., Aoyama, M., & Sventek, J. (2007). The impact of research on middleware technology. *ACM SIGSOFT Software Engineering Notes*, 32(1), 21-46.

Erdil, S., Erdil, O., & Keskin, H. (2004). The relationships between market orientation, firm innovativeness and innovation performance. *Journal of Global Business and Technology*, *1*(1), 1-11.

Ernst, D. (2002). Global production networks and the changing geography of innovation systems. Implications for developing countries. *Economics of Innovation and New Technology*, 11(6), 497–523.

Ettlie, J. E., Bridges, W. P., & O'keefe, R. D. (1984). Organization strategy and structural differences for radical versus incremental innovation. *Management Science*, *30*(6), 682-695.

Ettlie, J. E., & Reza, E. M. (1992). Organizational integration and process innovation. *Academy of Management Journal*, *35*(4), 795-827.

Evangelista, R., Iammarino, S., Mastrostefano, V., Silvani, A. (2001). Measuring the regional dimension of innovation: Lessons from the Italian innovation survey. *Technovation,* Vol. 21: 733-745.

Evelson, B., McNabb, K., Karel, R., & Barnett, J. (2007). It's time to reinvent your BI strategy. *Intelligent Enterprise*.

Fabricio Salvador, C. F. (2004). Effective product assortment communication: Overcoming the product variety paradox on the net. *IE Working Paper.*

Fahey, L. (1999), *Competitors: outwitting, outmanoeuvring and outperforming.* London, John Wiley and Sons, p. 44.

Falk, R. F. & N. B. Miller. (1992). *A primer for soft modelling*. Akron, Ohio, Univ. of Akron Press.

Fang, Y. H., & Chiu, C. M. (2010). In justice we trust: Exploring knowledge-sharing continuance intentions in virtual communities of practice. *Computers in Human Behaviour*, *26*(2), 235-246.

Fang, M., & Lin, F. (2006). Measuring the performance of ERP system-from the balanced scorecard perspectives. *Journal of American Academy of Business*, 10(1): 256-263.

Farrell, M. A., Oczkowski, E., & Kharabsheh, R. (2008). Market orientation, learning orientation and organisational performance in international joint ventures. *Asia Pacific Journal of Marketing and Logistics*, *20*(3), 289-308.

Fedouaki, F., Okar, C., & El Alami, S. (2013). A maturity model for business intelligence system project in small and medium-sized enterprises: An empirical investigation. *International Journal of Computer Science Issues*, *10*(6), 61.

Ferreira, J. J., G.S. Azevedo & R. Fernández. (2011). Contribution of resource-based view and entrepreneurial orientation on small firm growth. *Cuadernos de Gestión*, Vol.11.(1): p.95-116, DOI: 10.5295/cdg.100185jf.

Fichman, R. G. (2001). The role of aggregation in the measurement of information technology-related organizational innovation. *Information Systems Quarterly*, 25(4), 427-455.

Fiedler, F. E. (1964). A contingency model of leadership effectiveness. In *Advances in Experimental Social Psychology* (Vol. 1, pp. 149-190). Academic Press.

Field, A. (2009). *Discovering statistics using SPSS*. Sage publications.

Field, A. (2017). *Discovering Statistics Using IBM SPSS Statistics: North American Edition*. Sage.

Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research*, *19*(4), 440-452.

Fornell, C. & D. F. Lacker. (1981). Evaluating Structural Equation Models with unobservable variables and measurement error. *Journal of Marketing Research,* Vol. 18: p. 39-50

Freel, M., & De Jong, J. P. (2009). Market novelty, competence-seeking and innovation networking. *Technovation*, *29*(12), 873-884.

Fuentes-Fuentes, M. M., Albacete-Sáez, C. A., & Lloréns-Montes, F. J. (2004). The impact of environmental characteristics on TQM principles and organisational performance. *Omega*, *32*(6), 425-442.

Fuld, L. (2010). *The secret language of competitive intelligence: How to see through and stay ahead of business disruptions, distortions, rumours, and smoke screens*. Crown Business.

Gadrey, J., Gallouj, F., & Weinstein, O. (1995). New modes of innovation. *International Journal of Service Industry Management*, 6(3), 4-16.

Galbraith, J. (1973). *Designing complex organizations*. Reading, MA: Addison-Wesley.

Galbraith, J. (1977). *Organizational Design*. Reading, MA: Addision-Wesley.

Gall, M. D., Borg, W. R., & Gall, J. P. (2003). Case study research. *Educational research: An introduction*, 123-163.

Gallo, J. (2010). Who are the business intelligence leaders of tomorrow? *Business Intelligence Journal, 14*(4), 42-49.

Gallouj, F., & Weinstein, O. (1997). Innovation in services. *Research Policy*, 26(4-5), 537-556.

Gambardella, A., Harhoff, D., & Verspagen, B. (2008). The value of European patents. *European Management Review* ,5 ,69-84.

Gancia, G., & Zilibotti, F. (2005). Horizontal innovation in the theory of growth and development. *Handbook of Economic Growth*, *1*, 111-170.

Ganter, A., & Hecker, A. (2013). Deciphering antecedents of organizational innovation. *Journal of Business Research*, *66*(5), 575-584.

Garcia, R., & Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: A literature review. *The Journal of Product Innovation Management*, 19, 110-132.

Garson, G. D. (2016). Partial least squares: Regression and structural equation models. *Asheboro, NC: Statistical Associates Publishers*.

Gary M. Gaukler, O. O., Warren H. Hausman (2008). Order Progress Information: Improved Dynamic Emergency Ordering Policies. *Production and Operations Management*, 17(6), 599–613.

Gartner. (2007). *Gartner says more than 50 percent of data warehouse projects will have limited acceptance or will be failures through 2007*. http://www. gartner.com/it/page.jsp?id=492112.

Gartner. (2017). *Gartner says worldwide business intelligence and analytics market to reach $18.3 billion in 2017*. Gartner, Inc. from https://www. gartner.com/newsroom/id/361261

Gavrea, C., Ilies, L., & Stegerean, R. (2011). Determinants of organizational performance: The case of Romania. *Management and Marketing*, *6*(2).

George, D., & Mallery, P. (2001). SPSS for windows: 10.0 Update. *Massachusetts: Allyn & Bacon*, 84-87.

Georgopoulos, B. S., & Tannenbaum, A. S. (1957). A study of organizational effectiveness. *American Sociological Review*, *22*(5), 534-540.

Gessner, G. H. & Volonino, L. (2005). Quick Response Improves Return on Business Intelligence Investments. *Information Systems Management* (22:3), pp. 66–74.

Gibbons, R. (1992). *A Primer in Game Theory*. Harvester Wheatsheaf.

Gilad, B. (2011). Strategy without intelligence, intelligence without strategy. *Business Strategy Series*, *12*(1), 4-11.

Gile, K., Kirby, J. P., Karel, R., Teubner, C., Driver, E. and Murphy, B. (2006). *Topic overview: business intelligence*. Retrieved from Forrester database

Gilley, O. W., & Leone, R. P. (1991). A two-stage imputation procedure for item nonresponse in surveys. *Journal of Business Research*, *22*(4), 281-291.

Ginsberg, A. & N. Venkatraman. (1985). Contingency Perspectives of Organizational Strategy: A Critical Review of the Empirical Research. *Academy of Management Review*, Vol. 10. (3): p. 421-434.

Global Intelligence Alliance. (2004). Introduction to competitive intelligence. *GIA white paper*, *1*, 2004.

Goldman, S. L., Nagel, R. N., & Preiss, K. (1995). *Agile competitors and virtual organizations: Strategies for enriching the customer*. New York, Van Nostrand Reinhold.

Goles, T., & Hirschheim, R. (2000). The paradigm is dead, the paradigm is dead… long live the paradigm: the legacy of Burrell and Morgan. *Omega*, *28*(3), 249-268.

Gloet, M., & Terziovski, M. (2004). Exploring the relationship between knowledge management practices and innovation performance. *Journal of Manufacturing Technology Management*, *15*(5), 402-409.

Good, P.I. & Hardin, J.W. (2003). Common errors in statistics. New York: John Wiley.

Gordon, S. (1993). Standardization of information systems and technology at multinational companies. *Journal of Global Information Management (JGIM)*, *1*(3), 5-15.

Gorlenko, L., & Merrick, R. (2003). No wires attached: Usability challenges in the connected mobile world. *IBM Systems Journal*, 42(4), 639-651.

Götz, G., (1999). Monopolistic competition and the diffusion of new technology. *Rand Journal of Economics*, 30(4), 679-693.

Goulding, C. (1999). Consumer research, interpretive paradigms and methodological ambiguities. *European Journal of Marketing*, *33*(9/10), 859-873.

Gounaris, S. P., & Avlonitis, G. J. (2001). Market orientation development: a comparison of industrial vs consumer goods companies. *Journal of Business & Industrial Marketing*, *16*(5), 354-381.

Grant, R. M. (1991). The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation. *California Management Review*. Vol. 33. (3): p. 114-135.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, *17*(S2), 109-122.

Gray, W. B., & Shadbegian, R. J. (2003). Plant vintage, technology, and environmental regulation. *Journal of Environmental Economics and Management*, *46*(3), 384-402.

Green, S. G., Gavin, M. B., & Aiman-Smith, L. (1995). Assessing a multidimensional measure of radical technological innovation. *IEEE Transactions on Engineering Management*, *42*(3), 203-214.

Griliches, Z. (1998). *R & D and productivity: The econometric evidence*. Chicago: The University of Chicago Press.

Grooms, T. F. (2001). *Marketing intelligence: executive management perceptions of value* (Doctoral dissertation). Brunel University.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of Qualitative Research*, *2*(163-194), 105.

Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics*, *133*(2), 662-676.

Gunnar Stefansson, K. L. (2009). Performance issues of Smart Transportation Management systems. *International Journal of Productivity and Performance Management,* 58(1), 58

Gupta, A.K. & Govindarajan, V. (1984). Business unit strategy, managerial characteristics and business unit effectiveness at strategy implementation. *The Academy of Management Journal*, 27(1), 25-41.

Gustafson, L. T. & Reger, R. K. (1995). Using organizational identity to achieve stability and change in high velocity environments. In *Academy of Management Proceedings* (Vol. 1995, No. 1, pp. 464-468). Academy of Management.

Haenlein, M., & Kaplan, A. M. (2004). A beginner's guide to partial least squares analysis. *Understanding Statistics*, *3*(4), 283-297.

Hagedoorn, J. & Cloodt, M. (2003). Measuring innovative performance: Is there an advantage in using multiple indicators? *Research Policy*, 3 2 (8), 1365–1379.

Haines, J. D. (2004). *Managing Technological Innovation for Competitive Advantage: A Framework for Assessing the Relative Importance of the Components of Technology Utilized for Specific Activities within an Organization* Dissertation Research Project Present.

Hair Jr, J. F. (2007). Knowledge creation in marketing: The role of predictive analytics. *European Business Review*, *19*(4), 303-315.

Hair, Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (1992). *Multivariate data analysis with readings (3rd ed.).* New York, NY: Macmillan Publishing Company.

Hair, J. F., Anderson, R. E. Tatham, R.L., & Black W. C. (2005). *Multivariate data analysis*.

Hair, J. F., Black, W.C., Babin, J. B., & Anderson, E.R. (2010). *Multivariate data analysis*. Upper Saddle River; New Jersey, Pearson Education, Inc.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2014). *A primer on partial least squares structural equation modelling (PLS-SEM)*. Sage publications.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modelling (PLS-SEM)*. Sage Publications.

Hair, J.F., A.H. Money, P. Samouel, & M. Page. (2007). *Research methods for business*. Chichester: John Wiley & Sons.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139-152.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modelling: Rigorous applications, better results and higher acceptance. *Long Range Planning*, *46*(1-2), 1-12.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modelling in marketing research. *Journal of the Academy of Marketing Science*, *40*(3), 414-433.

Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. *Rand Journal of Economics*, 3 6 (1), 16-38.

Hameed, I. & B. Ali. (2011). Impact of entrepreneurial orientation, entrepreneurial management and environmental dynamism on firm's financial performance. *Journal of Economics and Behavioural Studies*. Vol. 3. (2): p. 101-114.

Hamel, G., & Prahalad, C. K. (1994). Competing for the Future. *Harvard Business Review*, *72*(4), 122-128.

Han, J. K., Kim, N., & Srivastava, R. K. (1998). Market orientation and organizational performance: is innovation a missing link? *Journal of Marketing*, *62*(4), 30-45.

Hana, U. (2013). Competitive advantage achievement through innovation and knowledge. *Journal of Competitiveness*, 5(1), 82–96.

Hannan, T.H. and McDowell, J.M., (1990). The impact of technology adoption on market structure. *Review of Economics and Statistics*, 72, 164-168.

Hanvanich, S., Sivakumar, K., & Hult, G. T. M. (2006). The relationship of learning and memory with organizational performance: The moderating role of turbulence. *Journal of the Academy of Marketing Science*, *34*(4), 600.

Harhoff, D., Narin, F., Scherer, F.M., & Vopel, K. (1999). Citation frequency and the value of patented inventions. *The Review of Economics and Statistics*, 81 (3), 511–515.

Harmsen, H., Grunert, K.G., & Declerck, F. (2000). Why Did We Make That Cheese? An Emprically Based Framework for Understanding What Drives Innovation Activity? *R&D Management*, Vol. 30: 151-166.

Hashi, I., & Stojčić, N. (2013). The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4. *Research Policy*, *42*(2), 353-366.

Hawker, D. S., & Boulton, M. J. (2000). Twenty years' research on peer victimization and psychosocial maladjustment: A meta-analytic review of cross-sectional studies. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *41*(4), 441-455.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, 76(4), 408-420.

Hayes, A. F. (2013). Introduction to mediation, moderation, and conditional process analysis: Methodology in the social sciences. *Kindle Edition*, *193*.

Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*, *67*(3), 451-470.

Hayes, A. F., & Rockwood, N. J. (2017). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behaviour Research and Therapy*, *98*, 39-57.

Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter? *Psychological Science*, *24*(10), 1918-1927.

He, W., & Wei, K. K. (2009). What drives continued knowledge sharing? An investigation of knowledge-contribution and-seeking beliefs. *Decision Support Systems*, *46*(4), 826-838.

Healy, M., & Perry, C. (2000). Comprehensive criteria to judge validity and reliability of qualitative research within the realism paradigm. *Qualitative Market Research: An International Journal*, *3*(3), 118-126.

Hegde, D., & Sampat, B. (2009). Examiner citations, applicant citations, and the private value of patents. *Economics Letters*,105 (3), 287-289.

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal*, (Special issue winter) 15, 63–84.

Henderson, J. C., & Venkatraman, H. (1999). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, *38*(2.3), 472-484.

Herrmann, A., Tomczak, T., & Befurt, R. (2006). Determinants of radical product innovations. *European Journal of Innovation Management*, *9*(1), 20-43.

Henseler, J., C.M. Ringle & R.R. Sinkovics. (2009). The use of partial least squares path modelling in international marketing. *Advances in International Marketing*. Vol. 20. P.277-319.

Herschel, R. T., & Jones, N. E. (2005). Knowledge management and business intelligence: The importance of integration. *Journal of Knowledge Management*, *9*(4), 45-55.

Hernando, I., & Núñez, S. (2004). The contribution of ICT to economic activity: A growth accounting exercise with Spanish firm-level data. *Investigaciones Económicas*, *28*(2).

Hertog, P. D. (2000). Knowledge-intensive business services as co-producers of innovation. *International Journal of Innovation Management*, *4*(04), 491-528.

Hitt, L. and Brynjolfsson, E. (1996). Productivity, business profitability, and consumer surplus: Three different measures of information technology value. *Management Information Systems Quarterly*, 20(2), 121-142.

Hitt, M. A., Hoskisson, R. E., Johnson, R. A., & Moesel, D. D. (1996). The market for corporate control and firm innovation. *The Academy of Management Journal*, 3 9 (5), 1084–1119.

Hipp, C., Tether, B. S., & Miles, I. (2000). The incidence and effects of innovation in services: evidence from Germany. *International Journal of Innovation Management*, *4*(04), 417-453.

Hou, C.-K. (2012). Examining the effect of user satisfaction on system usage and individual performance with business intelligence systems: An empirical study of Taiwan's electronics industry. *International Journal of Information Management*, *32*(6), 560–573. http://doi.org/10.1016/j.ijinfomgt.2012.03.001.

Hou, K., Xue, C., & Zhang, L. (2015). Digesting anomalies: An investment approach. *The Review of Financial Studies*, *28*(3), 650-705.

Hough, J. R., & White, M. A. (2003). Environmental dynamism and strategic decision-making rationality: An examination at the decision level. *Strategic Management Journal*, *24*(5), 481-489.

Howson, C. (2007). *Successful business intelligence*. Tata McGraw-Hill Education.

Hribar Rajterič, I. (2010). Overview of business intelligence maturity models. *Management: Journal of Contemporary Management Issues*, *15*(1), 47-67.

Hsu, P. H., Lee, H. H., Liu, A. Z., & Zhang, Z. (2015). Corporate innovation, default risk, and bond pricing. *Journal of Corporate Finance*, *35*, 329-344.

Huang, C. T., & Tsai, K. H. (2014). Synergy, environmental context, and new product performance: A review based on manufacturing firms. *Industrial Marketing Management*, *43*(8), 1407-1419.

Huck, S. W., & Comer, W. H. (2004). Reliability and validity. *Reading statistics and research.* Boston: Pearson Education, 75-98.

Hughes, J. (2005). Bringing emotion to work: Emotional intelligence, employee resistance and the reinvention of character. *Work, Employment and Society*, *19*(3), 603-625.

Huiban, J. P., & Bouhsina, Z. (1998). Innovation and the quality of labour factor: An empirical investigation in the French food industry. *Small Business Economics*, W(A), 389-100.

Hult G.T. M., R.F. Hurley & G.A. Knight. (2004). Innovativeness: Its antecedents and impact on business performance. *Industrial Marketing and Management*. Vol. 33: p. 429-438.

Hunton, J. E., Lippincott, B., & Reck, J. L. (2003). Enterprise resource planning systems: comparing firm performance of adopters and nonadopters. *International Journal of Accounting Information Systems*, *4*(3), 165-184.

Hurley, R.F., Hult, G.T.M., (1998). Innovation, market orientation and organizational learning: an integration and empirical examination. *Journal of Marketing*, Vol. 62: 42-54.

Hussein, Rezaie Dollatabady, Farzaneh, Ghandehari, & Amiri, Farham. (2011). Analyzing the impact of competitive intelligence on innovation at scientific research centers In Isfahan science and technology town. *Interdisciplinary Journal of Contemporary Research in Business, 3*(5), 940-948.

Ifinedo, P. (2011). An empirical analysis of factors influencing internet/e-business technologies adoption by SMEs in Canada. *International Journal of Information Technology & Decision Making*, *10*(04), 731-766.

Irani, Z., & Love, P. E. (2000). The propagation of technology management taxonomies for evaluating investments in information systems. *Journal of Management Information Systems*, 161-177.

Isik, O. (2010). *Business intelligence success: An empirical evaluation of the role of BI capabilities and the decision environment* (Doctoral dissertation). University of North Texas.

Işik, Ö., Jones, M. C., & Sidorova, A. (2013). Business intelligence success: The roles of BI capabilities and decision environments. *Information and Management*, *50*(1), 13–23. http://doi.org/10.1016/j.im.2012.12.001

Jackson, C. (1989). Building a competitive advantage through information technology. *Long Range Planning*, 22(4), 29-39.

Jaffe, A., Trajtenberg, M., & Henderson, R. (1993). Geographic localization of knowledge spillovers as evidenced by patent citations. *Quarterly Journal of Economics*, 1 0 8 (3), 577–598.

Jaharuddin, N.S., (2012). *Supply chain intelligence and its impact on competitive strategy and performance of business in Malaysia* (Doctoral dissertation). Universiti Putra Malaysia.

Jaharuddin, N. S., Mohamed, Z. A., & Sambasivan, M. (2014). Supply chain intelligence and its impact on business performance. *International Journal of Economics and Management (IJEM)*, *8*, 177-205.

Jaharuddin, N. S., Mohamed, Z. A., & Sambasivan, M. (2015). Supply chain intelligence in business organisations: A Malaysian perspective. *Pertanika Journal of Social Sciences & Humanities*, *23*.

Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, *52*(11), 1661-1674.

Jarvenpaa, S. L., Dickson, G. W., & DeSanctis, G. (1985). Methodological issues in experimental IS research: experiences and recommendations. *MIS Quarterly*, 141-156.

Jaworski, B., & Wee, L. C. (1993). Competitive Intelligence: Creating value for the organization. Final Report. *Society of Competitive Intelligence Professionals. Virginia*.

Jaworski B. J. & Kohli, A. K. (1993). Market orientation: Antecedents and consequences. *Journal of Marketing*, (57), pp. 53-70.

Jaworski, B. J., Macinnis, D. J., & Kohli, A. K. (2002). Generating competitive intelligence in organizations. *Journal of Market-Focused Management*, *5*(4), 279-307.

Jing, F. F., & Avery, G. C. (2008). Missing links in understanding the relationship between leadership and organizational performance. *International Business and Economics Research Journal*, 7(5), 67-78.

Jogaratnam, G. & E.C.Y. Tse. (2006). Entrepreneurial orientation and the structuring of organizations performance evidence from the Asian hotel industry. *International Journal of Contemporary Hospitality Management*, Vol. 18: p. 454-468.

Joglekar, N. R. & Yassine, A. (2002). Management of information technology driven product development processes. In T. Boone & R. Ganeshan (Eds.), *New Directions in Supply-Chain Management*. (pp. 125-152) New York, NY: Amacon Press.

Johannesson, J. & Palona, I. (2010). Environmental turbulence and the success of a firm's intelligence strategy: Development of research instruments. *International Journal of Management*, (27:3), pp. 448-458.

Johnson, T., P. Kulesa, I. Llc, Y.I. Cho & S. Shavitt. (2005). The relation between culture and response styles: Evidence from 19 countries. *Journal of Cross- Cultural Psychology*, p. 36-264.

Jokipii, A. (2010). Determinants and consequences of internal control in firms: A contingency theory-based analysis. *Journal of Management and Governance*, *14*(2), 115-144.

Jones, J., & Linderman, K. (2014). Process management, innovation and efficiency performance: The moderating effect of competitive intensity. *Business Process Management Journal*, *20*(2), 335-358.

Jöreskog, K. G. (1978). Structural analysis of covariance and correlation matrices. *Psychometrika*, *43*(4), 443-477.

Jorfi, S., Nor, K. M., & Najjar, L. (2011). The relationships between IT flexibility, IT-Business strategic alignment, and IT capability. *International Journal of Managing Information Technology*, *3*(1), 16-31.

Josh, L., & Julie, W. (2007). Innovation and incentives: Evidence from corporate R&D. *Review of Economics & Statistic*s, 8 9 (4), 634-644.

Jourdan, Z., Rainer, R. K. and Marshall, T. E. (2008). Business intelligence: An analysis of the literature. *Information Systems Management*, 25 (2), 121–131.

Julio, A. (2008). *The relationship among environmental turbulence, information technology convergence, strategic innovation management and overall performance: A cross border case* (Doctoral dissertation). Alliant International University.

Jusoh, D., Ibrahim, N., & Zainuddin, Y. (2008). The performance consequence of multiple performance measures Usage: Evidence from the Malaysian manufacturers. *International Journal of Productivity and Performance Management*, 57(2), 119-136.

Kahaner, L. (1996). The basics of competitive intelligence. *Competitive Intelligence: How to gather analyse and use information to move your business to the top.* New York: Simon & Schuster.

Kalton, G. (1968). Standardization: A technique to control for extraneous variables. *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, *17*(2), 118-136.

Kamal, M. M. (2006). IT innovation adoption in the government sector: Identifying the critical success factors. *Journal of Enterprise Information Management*, *19*(2), 192-222.

Kam-Sing Wong, S. (2014). Impacts of environmental turbulence on entrepreneurial orientation and new product success. *European Journal of Innovation Management*, *17*(2), 229-249.

Kaplan, R. S., & Norton, D. P. (1996). Linking the balanced scorecard to strategy. *California Management Review*, *39*(1), 53-79.

Karagozoglu, N. & Brown, W. B. (1993). Time-based management of the new product development process. *Journal of Product Innovation Management*, 10(3), 204-215.

Karacaoglu, K., Bayrakdaroglu, A., & San, F. B. (2012). The impact of corporate entrepreneurship on firms' financial performance: Evidence from Istanbul stock exchange firms. *International Business Research*, *6*(1), 163.

Karaev, A., Lenny Koh, S. C., & Szamosi, L. T. (2007). The cluster approach and SME competitiveness: a review. *Journal of Manufacturing Technology Management*, *18*(7), 818-835.

Karanja, E. (2011). *The mediating effect of innovation on the relationship between information technology investments and firm performance: An empirical study*. Morgan State University.

Kasasbeh, E. A., Harada, Y., & Noor, I. M. (2017). Factors influencing competitive advantage in banking sector: A systematic literature review. *Research Journal of Business Management*, *11*(2), 67-73.

Karki, M. M. S. (1997). Patent citation analysis: A policy analysis tool. *World Patent Information*, 1 9 (4),269–272.

Katila, R., & Chen, E. (2009). Effects of search timing on product innovation: The value of not being in sync with rivals. *Administrative Science Quarterly*, 5 3 (4), 593-625.

Katila, R., & Shane, S. (2005). When does lack of resources make new firms innovative? *Academy of Management Journal*. 48 (5), 814-829

Keen, P. G. (1991). *Shaping the future: business design through information technology*. Harvard Business School Press.

Kelly, F. P. (2011). *Reversibility and stochastic networks*. Cambridge University Press.

Kerlinger F.N., Lee H.B. (2000). *Foundations of Behavioural Research*, 4th ed., Thomson Learning, New York.

Kessler, E. H., & Chakrabarti, A. K. (1999). Speeding up the pace of new product development. *Journal of Product Innovation Management: An International Publication of the Product Development and Management Association*, *16*(3), 231-247.

Kettinger, W., Grover, V., Guha, S., & Segars, A. (1994). Strategic information systems revisited: A study in the sustainability and performance. *MIS Quarterly*, 18 (1), 31-58.

Kim, Y., & Lui, S. S. (2015). The impacts of external network and business group on innovation: Do the types of innovation matter? *Journal of Business Research*, *68*(9), 1964-1973.

Kimberly, J. R., & Evanisko, M. J. (1981). Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24(4), 689-713.

King, A. W. (2007). Disentangling Interfirm and Intrafirm Causal Ambiguity: A Conceptual Model of Causal Ambiguity and Sustainable Competitive Advantage. *Academy of Management Review*. Vol. 32. (1): p. 156-178.

Kinnear, T. C., & Taylor, J. R. (1996). *Marketing research: An applied research*. *USA:* McGrawhill.

Kirby, J. (2005). Toward a theory of high performance. *Harvard Business Review*, 83,30-39.

Kirca, A. H., Jayachandran, S., & Bearden, W. O. (2005). Market orientation: A meta-analytic review and assessment of its antecedents and impact on performance. *Journal of Marketing*, *69*(2), 24-41.

Kirchoff, B. (1977). Organization effectiveness measurement and policy research. *Academy of Management Review*, 2(3), 347-355.

Kline, R. B. (2005). *Methodology in the social sciences*.

Kobelsky, K., Richardson, V. J., Smith, R. E., & Zmund, R. W. (2008). Determinants and consequences of firm information technology budgets. *The Accounting Review*, 83 (4), 957-995.

Koberg, C., Detienne, D., and Heppard, K. (2003) An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation, *The Journal of High Technology Management Research*, 14, 1, 21-45.

Koellinger, P. (2008). The Relationship between technology, innovation, and firm performance: Empirical evidence on e-business in Europe. *Research in Management*, 29. http://doi.org/10.1016/j.respol.2008.04.024

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), 383-397.

Kohli, R. and Devaraj, S., (2003). Measuring information technology payoff: A meta-analysis of structural variables in firm-level empirical research. *Information Systems Research*, 14(2), 127-145.

Kohli, A. K., & Jaworski, B. J. (1990). Market orientation: the construct, research propositions, and managerial implications. *The Journal of Marketing*, 1-18.

Kotey, B., & Meredith, G. G. (1997). Relationship among owner/manager personal values, business strategies, and enterprise performance. *Journal of Small*.

Kraaijenbrink, J., Spender, J. C., & Groen, A. J. (2010). The resource-based view: A review and assessment of its critiques. *Journal of Management*, *36*(1), 349-372.

Kraus, S., J. P. C. Rigtering, M. Hughes & V. Hosman. (2012). Entrepreneurial orientation and the business performance of SMEs: A quantitative study from the Netherlands. *Review of Managerial Science*. Vol. 6. (2012): p. 161-182.

Krejcie, R., & Morgan, D. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.

Kreiser, P., Marino, L., & Weaver, K. M. (2002). Assessing the relationship between entrepreneurial orientation, the external environment and firm performance. *Frontiers of Entrepreneurship Research*, *22*(1).

Krücken-Pereira, L., Debiasi, F., & Abreu, A. F. (2001). Technological innovation and competitive intelligence: An interactive process. *READ-Electronic Journal of Directors*, *7*.

Kumar, S., Singh, B., Qadri, M. A., Kumar, Y. S., & Haleem, A. (2013). A framework for comparative evaluation of lean performance of firms using fuzzy TOPSIS. *International Journal of Productivity and Quality Management*, *11*(4), 371-392.

Kuswantoro, F., Rosli, M. M., & Kader, R. A. (2012). Innovation in Distribution Channel, Cost Efficiency & Firm Performance: The Case of Indonesian Small & Medium Enterprise Scales, *International Journal of Business, Humanities and Technology*, 2 (4), 23-38.

Lahrmann, G., Marx, F., Winter, R., & Wortmann, F. (2011). Business intelligence maturity: Development and evaluation of a theoretical model, *In Proceedings of the 44th Hawaii International Conference on System Sciences*.

Lanjour, J. O., & Schankerman, M. (2004). Patent quality and research productivity: Measuring innovation with multiple indicators. *The Economic Journal*, 114 (495), 441-465.

Laursen, K., & Foss, N. J. (2003). New human resource management practices, complementarities and the impact on innovation performance. *Cambridge Journal of economics*, *27*(2), 243-263.

Laursen, G.H.N. and Thorlund, J. (2010). *Business analytics for managers: Taking business intelligence beyond reporting*, Wiley.

Laursen, K., & Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, 27, 131–150.

Lawrence, P. & J. Lorsch. (1967). *Organizations and environment*. Boston, Harvard University Press.

Lawson, B., & Samson, D. (2001). Developing innovation capability in organisations: A dynamic capabilities approach. *International Journal of Innovation Management*, *5*(03), 377-400.

Lebas, M. J., & Euske, K. (2006). *A conceptual and operational delineation of performance, [in:] business performance measurement*. Theory and Practice, ed. A. Neely.

Lee, H., & Liu, Y. (2008). Impacts of organizational innovation capability and leadership styles on innovation performance for electronics information industry in Taiwan. *2008 IEEE International Conference on Service Operations and Logistics, and Informatics*, 2, 1903-1907.

Lee, S., Park, S. B., & Lim, G. G. (2013). Using balanced scorecards for the evaluation of "Software-as-a-service". *Information & Management, 50*, 553–561. https://doi.org/10.1016/j.im.2013.07.006

Lee, D. M., Trauth, E. M., & Farwell, D. (1995). Critical skills and knowledge requirements of IS professionals: A joint academic/industry investigation. *MIS Quarterly*, 313-340.

Lehmann, D. R., & Hulbert, J. (1972). Are three-point scales always good enough? *Journal of Marketing Research*, *9*(4), 444-446.

Lewin, A. Y., & Peeters, C. (2006). Offshoring work: Business hype or the onset of fundamental transformation? *Long Range Planning*, *39*(3), 221-239.

Lewin, A. Y., Massini, S., & Peeters, C. (2009). Why are companies offshoring innovation? The emerging global race for talent. *Journal of International Business Studies*, *40*(6), 901-925.

Lichtenberg, F. R. (1987). The effect of government funding on private industrial research and development: a re-assessment. *The Journal of Industrial Economics*, 97-104.

Lievens, A., Moenaert, R. K. & Jegers, R. (1999). Linking communication to innovation success in the financial services industry: A case study analysis. *International Journal of Service Industry Management*, 10(1), 23-47.

Li, S., Sun, B., & Montgomery, A. (2005). *Introducing what financial product to which customer at what time-An empirical analysis of customized and dynamic cross-selling campaigns*. Working Paper, Carnegie Mellon University.

Li, S., Sun, B., & Montgomery, A. L. (2011). Cross selling the right product to the right customer at the right time. *Journal of Marketing Research*, *48*(4), 683-700.

Lindner, F., & Wald, A. (2011). Success factors of knowledge management in temporary organizations. *International Journal of Project Management, 29*(7), 877-888. http://dx.doi.org/10.1016/j.ijproman.2010.09.003

Lindsay, N. J., & Balan-Vnuk, E. (2011). Exploring the innovation capability, entrepreneurial orientation, performance relationship in services sector firms (Summary). *Frontiers of Entrepreneurship Research*, *31*(9), 3.

Lippman, S. & R. Rumelt. (1982). Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *Bell Journal of Economics*, Vol. 13. P. 418-438.

Liu, S.S., Luo, X., & Shi, Y. (2002). Integrating customer orientation in organizations in transition: An empirical study. *International Journal of Research in Marketing*, Vol. 19: 367-382.

Love, S. R. a. J. H. (2001). Innovation and export performance: Evidence from UK and German manufacturing plants. *Working Paper Series*, (62),1-36.

Lönnqvist, A., & Pirttimäki, V. (2006). The measurement of business intelligence. *Information Systems Management* (23:1), pp. 32-40.

Loveman, G. W. (1994). An assessment of the productivity impact of information technologies. Information technology and the corporation of the 1990s. *Research Studies*, *84*, 110.

Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review*, 2/ (1), 135-172.

Lumpkin, G. T. & G. G. Dess. (2001). Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and life cycle. *Journal of Business Venturing*, Vol. 16: p. 429-451.

Lusthaus, C., & Adrien, M. H. (1998). Organizational assessment: A review of experience. *Universalia Occasional Paper*, *31*.

Lyon, D. W., Lumpkin, G. T., & Dess, G. G. (2000). Enhancing entrepreneurial orientation research: Operationalizing and measuring a key strategic decision-making process. *Journal of Management*, 26(5), 1055-1085. http://dx.doi.org/10.1177/014920630002600503.

Lyytinen, K. & Rose, G. M. (2003). The disruptive nature of information technology innovations: The case of internet computing in systems development organizations. *Information systems Quarterly*, 27(4), 557-595.

MacDuffie, J. P. (2007, April). Modularity and the geography of innovation. In *INFORMS Annual Meeting, Seattle*.

MacKinnon, D. P., Coxe, S., & Baraldi, A. N. (2012). Guidelines for the investigation of mediating variables in business research. *Journal of Business and Psychology*, *27*(1), 1-14.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, *7*(1), 83.

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioural Research*, 39, 99-128.

Madhavan, R., & Grover, R. (1998). From embedded knowledge to embodied knowledge: New product development as knowledge management. *Journal of Marketing*, *62*(4), 1-12.

Magnusson, P.R., Mathing, J. & Kristensson, P. (2003). Managing user involvement in service innovation. *Journal of Service Research*, 6(2), 111-124.

Maghrabi, R. O., Oakley, R. L., Thambusamy, R., & Iyer, L. S. (2011). The role of business intelligence (BI) in service innovation: An ambidexterity perspective. In *AMCIS*.

Mahmood, R. & Abd Wahid, R. (2012). Applying corporate entrepreneurship to bank performance in Malaysia. *Journal of Global Entrepreneurship*, 3(1), 68-82.

Mahoney, J. T. (2005). *Resource-based theory, dynamic capabilities and real option*s (pp. 167-217). Thousand Oaks: Economic Foundations of Strategy, Sage.

Makadok, R. (2001). Toward A Synthesis of the Resource-Based and Dynamic- Capability Views of Rent Creation. *Strategic Management Journal*, Vol. 22: p. 387- 401.

Malhotra, Y. (1996). Organizational learning and learning organizations: An overview. *WWW document+. URL http://www. brint. com/papersporglrng. htm*.

Malhotra, Y., & Galletta, D. (2003). Role of commitment and motivation as antecedents of knowledge management systems implementation. In *Proceedings of the 36th Hawaii International Conference on System Sciences*.

Mannino, M. V. (2007). *Database design, application, development, and administration* (3rd ed.). New York, NY: McGraw-Hill.

March, J. G., & Sutton, R. I. (1997). Organizational performance as a dependent variable. *Organization Science*, 8, 698-706.

Marcoulides, G. A. (1998). *Modern methods for business research*. Psychology Press.

Marín, L., Rubio, A., & de Maya, S. R. (2012). Competitiveness as a strategic outcome of corporate social responsibility. *Corporate Social Responsibility and Environmental Management*, *19*(6), 364-376.

Martin, C.R. & Horne, D.A. (1993). Services innovation: successful versus unsuccessful firms. *International Journal of Service Industry Management*, 4(1), 49-65.

Martin, C.R. & Horne, D.A. (1995). Level of success inputs for service innovations in the same firm. *International Journal of Service Industry Management*, 6(4), 40-56.

Martins, I., & A. Rialp. (2013). Entrepreneurial orientation, environmental hostility and sme profitability: A contingency approach. *Cuadernos De Gestión.* Vol. 13.(2): p. 67-88.

Martinsons, M., Davison, R., & Tse, D. (1999). The balanced scorecard: A foundation for the strategic management of information systems. *Decision Support Systems*, *25*(1), 71-88.

Massey, A. P., & Montoya-Weiss, M. M. (2006). Unravelling the temporal fabric of knowledge conversion: A model of media selection and use. *MIS Quarterly*, 99-114.

Matei, G. (2010). A collaborative approach of business intelligence systems. *Journal of Applied Collaborative Systems*, *2*(2), 91-101.

Maune, A. (2014). Competitive intelligence and firm competitiveness: An overview. *Corporate Ownership and Control*, *12*(1), 29-42.

Mavondo, F. T., Chimhanzi, J., & Stewart, J. (2005). Learning orientation and market orientation: Relationship with innovation, human resource practices and performance. *European Journal of Marketing*, *39*(11/12), 1235-1263.

McAdam, R., & McCreedy, S. (2000). A critique of knowledge management: using a social constructionist model. *New Technology, Work and Employment*, *15*(2), 155-168.

McGrath, M., & Iansiti, M. (1998). Envisioning IT-enabled product development. *PRTM Insight Magazine*, 1-12.

McGonagle, J. J., & Vella, C. M. (1996). *A new archetype for competitive intelligence*. Greenwood Publishing Group.

McKay, D. T., & Brockway, D. W. (1989). Building IT infrastructure for the 1990s. *Stage by stage*, *9*(3), 1-11.

McKenney, J. L., Mason, R. O., & Copeland, D. C. (1995). *Waves of change: Business evolution through information technology*. Harvard Business School Press.

Melville, N., Kraemer, K., and Gurbaxani, V. (2004). Review: information technology and organizational performance: An Integrative Model of IT Business Value. *MIS Quarterly* (28:2), pp. 283-322.

Mensah, E. (1989). Evaluating information systems projects: A perspective on cost-benefit analysis. *Information Systems*, *14*(3), 205-217.

Menguc, B., & Auh, S. (2006). Creating a firm-level dynamic capability through capitalizing on market orientation and innovativeness. *Journal of the Academy of Marketing Science*, *34*(1), 63-73.

Meyers, L. S., Gamst, G., & Guarino, A. J. (2016). *Applied multivariate research: Design and interpretation*. Sage publications.

Michaklisin, M.D., 1996, *Strategic assets and firm performance: An empirical study of the resource – based views* (Doctoral dissertation). Kent State University

Miles, R. E., Snow, C. C., Meyer, A. D., & Coleman, H. J. (1978). Organizational strategy, structure, and process. *Academy of Management Review*, *3*(3), 546-562.

Miller, D. (1983). The Correlates of Entrepreneurship in Three Types of Firms. *Management Science*. Vol. 29, p. 770–791.

Miller, D., & Friesen, P. H. (1982). Structural change and performance: Quantum versus piecemeal-incremental approaches. *Academy of Management Journal*, *25*(4), 867-892.

Miller, S. R. & A. D. Ross. (2003). An exploratory analysis of resource utilization across organizational units: Understanding the resource-based view. *International Journal of Operations & Production Management*. Vol. 23. (9): p.1062-1083.

Mishra, A.N. & Agarwal, R. (2010). Technological Frames, Organizational Capabilities, and IT Use: An Empirical Investigation of Electronic Procurement. *Information Systems Research,* (21:2), pp. 249-270.

Mithas, S., Ramasubbu, N., and Sambamurthy. (2011). How information management capability influences firm performance. *MIS Quarterly*, (35:1), pp. 237-256.

Moini, A. H. (1995). An inquiry into successful exporting: An empirical investigation using a three-stage model. *Journal of Small Business Management*, *33*(3), 9.

Mohsin, A. A., Halim, H. A., & Ahmad, N. H. (2015). Competitive intelligence among SMEs: Assessing the role of entrepreneurial attitude orientation on innovation performance. In *Innovation, finance, and the economy* (pp. 15-22). Springer, Cham.

Mol, M. J., & Birkinshaw, J. (2009). The sources of management innovation: When firms introduce new management practices. *Journal of Business Research*, *62*(12), 1269-1280.

Montgomery, C. A. (1994). Corporate diversification. *The Journal of Economic Perspectives*, *8*(3), 163-178.

Morgado, A. (2008). Ceeman case study Logoplaste. innovation in the global market from packaging to solution. *Management Decision,* 46(9), 2008.

Morgan, N. A., A. Kaleka & C.S. Katsikeas. (2004). Antecedents of export venture performance: A theoretical model and empirical assessment. *Journal of Marketing*, Vol. 68: p. 90-108.

Moreno, A. M., & Casillas, J. C. (2008). Entrepreneurial orientation and growth of SMEs: A causal model. *Entrepreneurship Theory and Practice*, *32*(3), 507-528.

Morrow, J. L., Sirmon, D. G., Hitt, M. A., & Holcomb, T. R. (2007). Creating value in the face of declining performance: Firm strategies and organizational recovery. *Strategic Management Journal*, 28 (3),271-283.

Moss, L. T & Atre, S. (2003). *Business intelligence roadmap: The complete project lifecycle for decision-support applications*. Boston, MA: Addison-Wesley.

Mu, J. & C. A. D. Benedetto. (2011). Strategic Orientations and New Product Commercialization: Mediator, Moderator, and Interplay. *R & D Management*. Vol. 41. (4): p. 337-359.

Mugo, H. W., Wanjau, K., & Ayodo, E. (2012). *An investigation into competitive intelligence practices and their effect on profitability of firms in the banking industry: A case of Equity Bank*.

Muller, R.M., Linders, S., & Pires, L.F. (2010). Business intelligence and service-oriented architecture: A Delphi study. *Information Systems Management*, (27), pp. 168-187.

Mundra, N., Gulati, K., & Vashisth, R. (2011). Achieving competitive advantage through knowledge management and innovation: Empirical evidences from the Indian IT sector. *IUP Journal of Knowledge Management*, *9*(2).

Murmann, J. P. (2003). *Knowledge and competitive advantage: The coevolution of firms, technology, and national institutions*. Cambridge University Press.

Murty, M. N., & Kumar, S. (2003). Win–win opportunities and environmental regulation: testing of porter hypothesis for Indian manufacturing industries. *Journal of Environmental Management*, *67*(2), 139-144.

Nada R, S. (2008). Pattern of information technology use: The impact on buyer–suppler coordination and performance. *Journal of Operations Management,* 26(3), 349-367.

Nadler, D., & Tushman, M.L. (1997). *Competing by design: The power of organizational architecture*. New York, NY: Oxford Business Press.

Naman, J. L. & D.P. Slevin. (1993). Entrepreneurship and the Concept of Fit: A Model and Empirical Tests. *Strategic Management Journal,* Vol.14. (2): p. 137-153.

Nambisan, S. (2003). Information systems as a reference discipline for new product development. *MIS quarterly*, 1-18.

Naranjo Valencia, J. C., Sanz Valle, R., & Jiménez Jiménez, D. (2010). Organizational culture as determinant of product innovation. *European Journal of Innovation Management*, *13*(4), 466-480.

Nazri, M. A., (2015). *Influences of entrepreneurial orientation, market orientation, and corporate social responsibility on performance: A study of takaful agency in Malaysia* (Doctoral dissertation). Universiti Sains Islam Malaysia.

Nazri, M. A., Wahab, K. A., & Omar, N. A. (2015). The effect of entrepreneurial orientation dimensions on takaful agency's business performance in Malaysia. *Jurnal Pengurusan*, *45*, 83-94.

Negash, S. (2004). Business intelligence. *Communications of the Association for Information Systems*, *13*, 177–195. doi:10.1007/978-3-540-48716-6_9.

Nelson, R., & Winter, S. (1982). *An evolutionary theory of economic change.* Cambridge, MA: Harvard University Press.

Nelson, R. R. (1992). *What is 'Commercial' and what is 'Public' about technology and what should be*? In N. Rosenberg, R. Landau & D. C. Mowery (Eds.), Technology and the Wealth of Nations (p. 59). Stanford: Stanford University Press.

Ness, L. R. (2005). Assessing the relationships among IT flexibility, strategic alignment, and IT effectiveness: Study overview and findings. *Journal of Information Technology Management*, 16(2).

Newbert, S. L. (2007). Empirical Research on the resource-based view of the firm: An assessment and suggestions for future research. *Strategic Management Journal*. Vol.28. (2): p.121-146.

Newman, P., Ers, A., Us, C., Isengildina-massa, O., Zapata, S. D., Carpio, C. E., & Fenyvesi, L. (2014). ICTs adoption for accessing agricultural information: evidence from Indian agriculture. *ICT in Agriculture*, *9*(2), 199. http://doi.org/10.5958/0974-

0279.2014.00024.X.

Ngugi, J. K., Gakure, R. W., & Mugo, H. (2012). Competitive intelligence practices and their effect on profitability of firms in the Kenyan banking industry. *International Journal of Business and Social Research*, *2*(3), 11-18.

Nicolaou, A. I. (2004). Firm performance effects in relation to the implementation and use of enterprise resource planning systems. *Journal of Information Systems*, *18*(2), 79-105.

Niederman, F., Brancheau, J.C., & Wetherbe, J.C. (1991). Information systems management issues for the 1990s, *MIS Quarterly*, (15:4), pp. 475-500.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), 14-37.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford university press.

Nonaka, I., Toyama, R., & Nagata, A. (2000). A firm as a knowledge-creating entity: a new perspective on the theory of the firm. *Industrial and corporate change*, *9*(1), 1-20.

Nord, W. R., & Tucker, S. (1987). *The organizational dynamics of implementing innovation: Implementing routine and radical innovations.* Lexington Books, Lexington, MA, 3-39.

Nunnally, J. C. (1967). *Psychometric theory.* New York: McGraw-Hill.

Nunnally, J.C. (1978). *Psychometric theory*. New York: McGraw Hill.

Nunnally, J. C., & Bernstein, I. H. (1994). Validity. *Psychometric theory*, 99-132.

O'Connor, P. (2003). On-line pricing: an analysis of hotel-company practices. Cornell *Hotel and Restaurant Administration Quarterly*, Vol. 44 No. 1, pp. 88-96.

Ofoegbu, O. E., & Akanbi, P. A. (2012). The influence of strategic agility on the perceived performance of manufacturing firms in Nigeria. *The International Business & Economics Research Journal (Online)*, *11*(2), 153.

Oh, W., & Pinsonneault, A. (2007). On the assessment of the strategic value of information technologies: conceptual and analytical approaches. *MIS quarterly*, 239-265.

Oke, A., Burke, G., & Myers, A. (2007). Innovation types and performance in growing UK SMEs. *International Journal of Operations & Production Management*, *27*(7), 735-753.

Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information and Management*, *51*(5), 497-510.

Olszak, C. M. and Ziemba, E. (2003). Business intelligence as a key to management of an enterprise. Proceedings of Informing Science and IT Education. Santa Rosa, CA. Retrieved from http://proceedings.informingscience.org/IS2003Proceedings/docs/109Olsza.pdf.

Olszak, C. M., & Ziemba, E. (2012). Critical success factors for implementing business intelligence systems in small and medium enterprises on the example of upper Silesia, Poland. *Interdisciplinary Journal of Information, Knowledge, and Management*, *7*(2), 129-150.

Omri, A., & Hasna, M. O. (2015). Performance analysis of cooperative communication system with feedback delay and channel estimation error. In *2015 International Conference on Information and Communication Technology Convergence (ICTC)* (pp. 135-140). IEEE.

Orlitzky, M., Schmidt, F.L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta- analysis. *Organization Studies*, 24 (3), 403-441.

Osei-Bryson, K. M., & Ko, M. (2004). Exploring the relationship between information technology investments and firm performance using regression splines analysis. *Information and Management*, *42*(1), 1-13.

Osuagwu, L. (2006). Market orientation in Nigerian companies. *Marketing Intelligence and Planning*, *24*(6), 608-631.

Owusu, A. (2017). Business intelligence systems and bank performance in Ghana: The balanced scorecard approach. *Cogent Business and Management*, *4*(1), 1364056.

Ozer, M. (2000). Information technology and new product development: opportunities and pitfalls. *Industrial Marketing Management*, 29(5), 387-396.

Pallant, J. (2005). *SPSS survival manual: A step by step guide to using SPSS for windows (version 12).* New South Wales, Australia: Allen & Unwin.

Pallant, J. (2007). *SPSS survival manual: A step by step guide to data analysis using SPSS for Windows*. England: McGraw.

Pallant, J. (2011). *SPSS survival manual: A step by step guide to data analysis using SPSS*. Crows Nest New South Wales Australia: Allen and Unwin.

Pantazi, M. A. A., & Georgopoulos, N. B. (2006). Investigating the impact of business-process-competent information systems (ISs) on business performance. *Managing Service Quality: An International Journal*, *16*(4), 421-434.

Park, Y.-J., & Rim, M.-H. (2011). The relationship analysis of RFID adoption and organizational performance. *ICSNC 2011, The Sixth International Conference on Systems and Networks Communications*, (c), 76–82.

Partanen, J., Chetty, S. K., & Rajala, A. (2014). Innovation types and network relationships. *Entrepreneurship Theory and Practice*, *38*(5), 1027-1055.

Pavlou, P.A. & El Sawy, O.A. (2006). From IT leveraging competence to competitive advantage in turbulent environments: The case of new product development. *Information Systems Research*, (17:3), pp. 198-227.

Pavlou, P.A. & El Sawy, O.A. (2010). The 'Third Hand': IT-Enabled competitive advantage in turbulence through improvisational capabilities. *Information Systems Resear*ch, (21:3), pp. 442-471.

Pearce, J.A., & Robinson, R.B. (2002). *Strategic Management*: Boston: Mc-Graw Hill.

Pehrsson, A. (2006). Business relatedness and performance: A study of managerial perceptions. *Strategic Management Journal,* 27(3), 265-282.

Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of Operations Management*, *30*(6), 467-480.

Penrose, E. T. (1959). The theory of the growth of the firm. New York, NY: John Wiley and Sons.

Partanen, J., Chetty, S. K., & Rajala, A. (2014). Innovation types and network relationships. *Entrepreneurship Theory and Practice*, *38*(5), 1027-1055.

Pervez, G. (2005). *Research methods in business studies: A practical guide, 3/E*. Pearson Education India.

Peschel, D. (2008). Total quality management and the Malcolm Baldrige National Quality Award: Benefits and directions for banking institutions. *Business Renaissance, 3*(4), 49-66.

Peteraf, M. A. (1993). The Cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, Vol.14. (179-191).

Petrişor, I. & Strain, N.A. (2013). Approaches on the competitive intelligence. *The USV Annals of Economics and Public Administration,* Volume 13, Number 1(17), 100-109.

Pickard, A. J. (2013). *Research methods in information*. Facet publishing.

Pierce, J. L. & Delbecq, A. L. (1977). Organization structure, individual attitudes and innovation. *Academy of Management Review*, 2(1), 26-37.

Pla-Barber, J., & Alegre, J. (2007). Analysing the link between export intensity, innovation and firm size in a science-based industry. *International Business Review*, *16*(3), 275-293.

Polanyi, M. (1962). Knowledge and being. *New York, Roufledge*.

Poston, R., & Grabski, S. (2001). Financial impacts of enterprise resource planning implementations. *International Journal of Accounting Information Systems*, *2*(4), 271-294.

Porter, M. E. (1980). Industry Structure and Competitive Strategy: Keys to Profitability. *Financial Analysts Journal*, *36*(4), 30-41.

Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performanc*e. New York, NY: Free Press.

Porter, M. E. (Ed.). (1986). *Competition in global industries*. Harvard Business Press.

Porter, M. E. (1990), *The competitive advantage of nations*, MacMillan, New York, NY.

Porter, M. E. (1996). What is strategy. *Published November*.

Porter, M. E., & Kramer, M. R. (2006). The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, *84*(12), 78-92.

Powell, C. (2001). Competitive advantage: Logical and Philosophical Considerations. *Strategic Management Journal*, Vol. 22. (9): p.875-888.

Powell, T. C., & Dent-Micallef, A. (1997). Information technology as competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal*, *18*(5), 375-405.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Boston (Ma)*, *1990*, 235-256.

Prajogo, D. I. (2006). Progress of quality management practices in Australian manufacturing firms. *The TQM Magazine*, *18*(5), 501-513.

Prajogo, D. I., & Sohal, A. S. (2003). The relationship between TQM practices, quality performance, and innovation performance: An empirical examination. *International Journal of Quality and Reliability Management*, *20*(8), 901-918.

Pratono, A., & Mahmood, R. (2014). Moderating Impact of Environmental Turbulence in the Relationship between Entrepreneurial Management and Firm Performance. In *Pratono, AH, & Mahmood (2014)." Moderating Impact of Environmental Turbulence in the Relationship between Entrepreneurial Management and Firm Performance" Presented for the 3rd International Conference on Social Science and Business*.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior research Methods, Instruments, and Computers*, *36*(4), 717-731.

Preacher, K. J., & Hayes, A. F. (2008). Assessing mediation in communication research. *The Sage sourcebook of advanced data analysis methods for communication research*, 13-54.

Preissl, B. (1999). Service innovation: what makes it different? Empirical evidence from Germany. In J. S. Metcalfe & I. Miles (Eds), *Innovation systems in the service economy: Measurement and case study analysis* (Chapter 7). (pp. 125-147) Boston, MA: Kluwer Academic Publishers.

Priem, R. L. & J. E. Butler. (2001). Is the resource-based 'view' a useful perspective for strategic management research? *Academy of Management Review*. Vol. 26. (1): p. 22-40.

Priporas, C.V., Gastoris, L., & Zacharis, V. (2005). Competitive intelligence activity: Evidence from Greece. *Marketing Intelligence and Planning, 23*(7), 659-669.

Qu, R., & Ennew, C. T. (2003). An examination of the consequences of market orientation in China. *Journal of Strategic Marketing*, *11*(3), 201-214.

Rai, A., & Sambamurthy, V. (2006). Editorial notes - the growth of interest in services management: Opportunities for information systems scholars.

Rai, A. & Tang, X.L. (2010). Leverage information technology capabilities and competitive process capabilities for the management of interorganizational relationship portfolios. *Information Systems Research*, (21:3), pp. 516-542.

Raisinghani, M. S., Benoit, A., Ding, J., Gomez, M., Gupta, K., Gusila, V., ... & Schmedding, O. (2004). Ambient intelligence: Changing forms of human-computer interaction and their social implications. *Journal of Digital Information*, *5*(4).

Ramachandran, K., Devarajan,T. P., & Ray, S.(2006). Corporate entrepreneurship: How? *VIKALPA*, 31(1), 85-97.

Ramanathan, R., Black, A., Nath, P., & Muyldermans, L. (2010). Impact of environmental regulations on innovation and performance in the UK industrial sector. *Management Decision*, *48*(10), 1493-1513.

Ramayah, T., Yan, L. C., & Sulaiman, M. (2005). SME e-readiness in Malaysia: Implications for planning and implementation. *Sasin Journal of Management*, 11(1), 103 - 120.

Ramayah, T., Cheah, J., Chuah, F., Ting, H., & Mumtaz, M. (2018). *Partial Least Squares Structural Equation Modelling using SmartPLS 3.0*. Kuala Lumpur: Pearson.

Ramirez, F.J., Gloria Parra-Requena, Maria J. Ruiz-Ortega, & Pedro M. Garcia-Villaverde, (2018). From external information to marketing innovation: the mediating role of product and organizational innovation. *Journal of Business & Industrial Marketing*, Vol. 33 Issue: 5, pp.693-705, https://doi.org/10.1108/JBIM-12-2016-0291

Ranjit, B. (2004). Knowledge management metrics. *Industrial Management and Data Systems*. Vol. 104 No. 6, pp. 457-68.

Rao, H. R., Chaudhury, A., & Chakka, M. (1995). Modelling team processes: Issues and a specific example. *Information Systems Research*, *6*(3), 255-285.

Ravichandran, T., and C. Lertwongsatien. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. *Journal of Management Information Systems,* 21, 237–276.

Ravichandran, T., Liu, Y., & Hasan, I. (2009). Diversification and firm performance: Exploring the moderating effects of information technology spending. *Journal of Management Information Systems*, 2 5(4), 205–240.

Ravetz, J. R., (1971). *Scientific knowledge and social problems*. Oxford: Oxford University Press.

Ray, G., Barney, J. B., & Muhanna, W. A. (2004). Capabilities, business processes, and competitive advantage: Choosing the dependent variable in empirical tests of the resource-based view. *Strategic Management Journal*, 2 5 ,23-37.

Rouse, M. J., & Daellenbach, U. S. (2002). More thinking on research methods for the resource-based perspective. *Strategic Management Journal*, *23*(10), 963-967.

Reason, P., & Rowan, J. (1981). *Human inquiry: A sourcebook of new paradigm research*. John Wiley & Sons.

Reed & DeFillipi, (1990). Casual ambiguity, barriers to imitation, and sustainable competitive advantage. *Academy of Management Review*, 15: 88-102.

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and variance-based SEM. *International Journal of Research in Marketing*, *26*(4), 332-344.

Reinganum, J., (1981). Market structure and the diffusion of new technology. *Bell Journal of Economics*. 12, 618-624.

Remenyi, D., Money, A. H., Sherwood-Smith, M., Twite, A., & Irani, Z. (2000). *The effective measurement and management of IT costs and benefits*. Elsevier.

Reynolds, N. L., Simintiras, A. C., & Diamantopoulos, A. (2003). Theoretical justification of sampling choices in international marketing research: key issues and guidelines for researchers. *Journal of International Business Studies*, *34*(1), 80-89.

Rice, R. E., & Rogers, E. M. (1980). Reinvention in the innovation process. *Knowledge*, *1*(4), 499-514.

Richard, O. C., Murthi, B. P. S., & Ismail, K. (2007). The impact of racial diversity on intermediate and long-term performance: The moderating role of environmental context. *Strategic Management Journal*, 28(12), 1213-1233.

Richard, P. J., Devinney, T. M., Yip, G. S., & Johnson, G. (2009). Measuring organizational performance: Towards methodological best practice. *Journal of Management*, 35 (3), 718-804.

Rigdon, Edward E., (2012). Rethinking partial least squares path modelling: in praise of simple methods. *Long Range Planning* 45 (5–6), 341–358.

Rindfleisch, A., Malter, A. J., Ganesan, S., & Moorman, C. (2008). Cross-sectional versus longitudinal survey research: Concepts, findings, and guidelines. *Journal of Marketing Research*, *45*(3), 261-279.

Ringle, C.M., Wende, S., & Will, A. (2005). Smartpls, Available at Http://Www.Smartpls.De.

Ringle, C. M., Sarstedt, M., & Straub, D. (2012). A critical look at the use of PLS-SEM in MIS Quarterly. *MIS Quarterly (MISQ)*, *36*(1).

Ringle, C. M., Wende, S., & Becker, J. M. (2014). SmartPLS 3. Hamburg: SmartPLS. *Academy of Management Review*, *9*, 419-445.

Ringle, C. M., Wende, S., & Becker, J. M. (2015). SmartPLS 3. *Boenningstedt: SmartPLS GmbH*.

Ritacco, M., & Carver, A. (2007). The business value of business intelligence - A framework for measuring the benefits of business intelligence. *Business Objects*, *6*.

Roberts, P. W. (1999). Product innovation, product-market competition and persistent profitability in the U.S. pharmaceutical industry. *Strategic Management Journal*, 20, 655–670.

Roberts, P. W., & Amit, R. (2003). The dynamics of innovative activity and competitive advantage: The case of Australian retail banking, 1981 to 1995. *Organization Science*, 1 4 (2), 107–122.

Robertson, T. S. (1971). *Innovative behaviour and communication*. New York, NY: Holt, Rinehart and Winston.

Robertson, C. & S. K. Chetty. (2000). A contingency-based approach to understanding export performance. *International Business Revie*w, Vol. 9. (2000): p. 211–235.

Robertson, P.L., Yu, T.F. (2001). Firm strategy innovation and consumer demand: A market process approach., *Managerial and Decision Economics*, Vol. 22: 183-199.

Robey, D. (1987). Implementation and the organizational impacts of information systems. *Interfaces*, *17*(3), 72-84.

Robson, C. (2002). *Real world research: A resource for social scientist and practitioner researchers*. Malden, MA: Blackwell.

Rodriguez, E. M., Donenberg, G. R., Emerson, E., Wilson, H. W., Brown, L. K., & Houck, C. (2014). Family environment, coping, and mental health in adolescents attending therapeutic day schools. *Journal of Adolescence*, *37*(7), 1133-1142.

Rogers, E. (1962). *Diffusion of innovation*. New York, NY: The Free Press.

Rogers, E. (1995). *Diffusion of innovations* (4th ed.). New York, NY: Free Press

Romer, Paul (1990). Endogenous technological change. *Journal of Political Economy*. 98: 71-102.

Rosenberg, M. (1968). The logic of survey analysis. New York, Basic Books.

Rosenkopf. L., & Nerkar A. (2001). Beyond local research: Boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, 2 2 (4), 287–306.

Ross, J. W., Beath, C. M., & Goodhue, D. L. (1996). Develop long-term competitiveness through IT assets. *Sloan Management Review*, *38*(1), 31-42.

Rouse, W. (1999). Connectivity, creativity, and chaos. *Information Knowledge Systems Management*, 1(2), 117-132.

Rouse, M. J. & U. S. Daellenbach. (2002). More thinking on research methods for the resource-based perspective. *Strategic Management Journal*, Vol. 23. (10): p.963-967.

Rubin, P. H. (1973). The expansion of firms. *Journal of Political Economy*, *81*(4), 936-949.

Ruey-Gwo, C., & Chieh-Ling, L. (2007). The relationship between leadership behaviour and organizational performance in non-profit organizations, using social welfare charity foundations as an example. *Journal of American Academy of Business, 12*(1), 83-88.

Rugman, A. M., & Verbeke, A. (1998). Corporate strategies and environmental regulations: An organizing framework. *Strategic Management Journal*, *19*(4), 363-375.

Rugman, A. M., & Verbeke, A. (2000). Multinational enterprises and public policy. In *International Business* (pp. 21-43). Palgrave Macmillan, London.

Rumelt, R. P. (1984). *Towards a strategic theory of the firm*. In R. P. Lamb (Ed.), Competitive Strategic Management: 556-571. Englewood Cliffs, NJ: Prentice-Hall.

Runyan, R., P. Huddleston & J. Swinney. (2006). Entrepreneurial orientation and social capital as small firm strategies: A study of gender differences from a resource-based view. *Entrepreneurship Management*, Vol. 2: p. 455-477.

Saeed, K. A., Grover, V., & Hwang, Y. (2005). The relationship of e-commerce competence to customer value and firm performance: An empirical investigation. *Journal of Management Information Systems*, *22*(1), 223-256.

Salaman, G., & Storey, J. (2002). Managers' theories about the process of innovation. *Journal of Management Studies*, *39*(2), 147-165.

Sambamurthy, V., & Zmud, R. W. (1992). *Managing IT for success: The empowering business partnership*. Financial Executives Research Foundation.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly*, 237-263.

Sanchez, C. M., & McKinley, W. (1998). Environmental regulatory influence and product innovation: the contingency effects of organizational characteristics. *Journal of Engineering and Technology Management*, *15*(4), 257-278.

Sánchez, J. I. L., Rata, B. M., Duarte, A. R., & Sandulli, F. D. (2006). Is the internet productive? A firm-level analysis. *Technovation*, *26*(7), 821-826.

Santhanam, R., & Hartono, E. (2003). Issues in linking information technology capability to firm performance. *MIS Quarterly*, 125-153.

Sarkees, M., & Luchs, R. (2015). The influence of marketing and innovation investments on alliance type choice. *Journal of Business and Industrial Marketing*, *30*(5), 626-636.

Sasvar, L. C. (2015). From performance measurement to strategic management model: balanced scorecard, *Journal of Economic Development, Environment and People*, 4(1), 7 – 15.

Saunders, M. N., & Lewis, P. (2012). *Doing research in business & management: An essential guide to planning your project*. Pearson.

Scheel, C. (2005). Creating economic value added through enabling technologies. *Journal of Integrated Design and Process Science*, 9(4), 41-59.

Schein, E. (1970). The role innovator and his education. *Technology Review* ,72, 33-37.

Schein, E. H. (1994). *Innovative cultures and organizations*. In T. J. Allen & M. S. Scott (Eds.), *Information technology and the corporation of 1990s: Research studies.* New York, NY: Oxford University Press.

Scherer, F. M. (1965). Firm size, market structure, opportunity, and the output of patented inventions. *The American Economic Review* ,5 5 ,1097-1125.

Scherer, F. M. (1980). *Industrial market structure and economic performance* (2nd ed.). Chicago, IL: Rand McNally College.

Scherer, F. M. (1992). *International high-technology competition*. Harvard University Press.

Schiavone, F. (2011). Strategic reactions to technology competition: A decision-making model. *Management Decision*, *49*(5), 801-809.

Schilling, M. A. (2000). Toward a general modular systems theory and its application to interfirm product modularity. *Academy of Management Review*, *25*(2), 312-334.

Scholl, H. (2005). *Innovation drivers of growth*. CBI sharing knowledge with the business and academic communities, Carnegie Bosch Institute for applied studies in international management.

Schoonoven, C. B. (1981). Problems with contingency theory: Testing assumptions hidden within the language of contingency theory. *Administrative Science Quarterly*, Vol. 26: p. 349-377.

Schramm, C. (2008). *Innovation measurement: Tracking the state of innovation in the American Economy*. A report to the Secretary of Commerce by the advisory committee on measuring innovation on the 21st century Economy.

Schumpeter, Joseph A. (1934). *The theory of economic development*. Cambridge: Harvard University Press.

Schumpeter, J. A. (1976). *Innovation and the evolution of marke*t. Capitalism, Socialism and Democracy, (5th ed.). London.

Schubert, J. (2015). 4 top challenges facing the banking industry. *Digital Economy*.

Schuller, B.J. & Lidbom, M. (2009). Competitiveness of nations in the global economy. *Economics and Management*, 14: 934-939.

Schwanitz, S., Muller, R., & Margret Will, M. (2002). Competitiveness of economic sectors in EU accession countries: Cluster-oriented assistance strategies. *Deutsche Geseltschaft Fuer Teschnishe Zusammenarbeit (GTZ), Eschborn*.

Scott, D. A., Mark, W. J., & Joseph, V. S. (2008). Institutionalizing innovation. *MIT Sloan Management Review, 49*(20), 1-10.

Sebora, T.C., Theerapatuong, T. & Lee, S.M. (2010). Corporate Entrepreneurship in The Face of Changing Competition. *Journal of Organizational Change Management*, 23(4), 453-470.

Sekaran, U. (2000). Research Methods for Business; A skill business approach. *New York: John Wiley and Sons*.

Sekaran, U. (2003). *Research methods for business: A skill building approaches* (4th ed.). New York: John Wiley & Sons Inc.

Sekaran, Uma, and R. Bougie. (2010). *Research methods for business: A skill building approach.* Wiley.

Seltzer, M. (2005). Beyond relational databases. *Queue*, 3(3), 50–58.

Seppälä, T. (2013). Tracking offshoring and outsourcing strategies in global supply chains. In *the Offshoring Challenge* (pp. 57-76). Springer London.

Sethi, V., & King, W. R. (1994). Development of measures to assess the extent to which an information technology application provides competitive advantage. *Management Science*, *40*(12), 1601-1627.

Sethi, R., Smith, D. C., & Park, C. W. (2001). Cross-functional product development teams, creativity, and the innovativeness of new consumer products. *Journal of Marketing Research*, *38*(1), 73-85.

Servais, D. (1988). A European Financial Area. *Brussels. Vives, Xavier (1990). Deregulation and Competition in Spanish Banking*.

Sewdass, N., & Du Toit, A. (2014). Current state of competitive intelligence in South Africa. *International Journal of Information Management*, *34*(2), 185-190.

Shan, W., Walker, G., & Kogut, B. (1994). Interfirm cooperation and start-up innovation in the biotechnology industry. *Strategic Management Journal*, 15 (5), 387-394.

Shan, W., & Zhang, Q. (2009). Extension theory and its application in evaluation of independent innovation capability. *Kybernetes*, *38*(3/4), 457-467.

Shapiro, C., & Varian, H. R. (1999). The art of standards wars. *California Management Review*, *41*(2), 8-32.

Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality (complete samples). *Biometrika*, *52*(3/4), 591-611.

Sheng, M., & Hartono, R. (2015). An exploratory study of knowledge creation and sharing in online community: A social capital perspective. *Total Quality Management and Business Excellence*, *26*(1-2), 93-107.

Shook, C. L., Ketchen Jr, D. J., Hult, G. T. M., & Kacmar, K. M. (2004). An assessment of the use of structural equation modelling in strategic management research. *Strategic Management Journal*, *25*(4), 397-404.

Short, J. C., Ketchen, D. J., Palmer, T. B., & Hult, G. T. M. (2007). Firm, strategic group, and industry influences on performance. *Strategic Management Journal*, 28 (2), 147–167.

Shubiri, F. N. (2012). Measuring the impact of business intelligence on performance: An empirical study. *Polish Journal of Management Studies*, *6*, 162-173.

Siegel, S. (2002). Network-supported applications. *Bell Labs Technical Journal*, 6(2), 30-31.

Silverberg, G., & Verspagen, B. (2006). The size distribution of innovations revisited: An application of extreme value statistics to citation and value measures of patent significance. *Journal of Econometrics*, 139 ,318–339.

Silvius, A. J., De Waal, B., & Smit, J. (2009). Business and IT alignment; answers and remaining questions. *PACIS 2009 Proceedings*, 44.

Singh, N., Lai, K., & Cheng, T. C. E. (2007). Intra-organizational perspectives on IT-enabled supply chains. Aligning technology decisions with relevant organizational practices and policies. *Communications of the ACM*, 50(1), 59-65.

Sircar, S., Turnbow, J. L., & Bordoloi, B. (2000). A framework for assessing the relationship between information technology investments and firm performance. *Journal of Management Information Systems*, *16*(4), 69-97.

Škrinjar R, Bosilj Vukšić V., Indihar Štemberger M. (2010), Adoption of Business Process Orientation Practices: Slovenian and Croatian Survey, *Business Systems Research*, Vol. 1 No. 1-2, pp. 5-20

Smith, K. G., & Hitt, M. A. (Eds.). (2005). *Great minds in management: The process of theory development*. Oxford University Press on Demand.

Smith, J., & Kossou, L. (2008). The emergence and uniqueness of competitive intelligence in France. *Journal of Competitive Intelligence and Management*, *4*(3), 63-85.

Smith, J. R., Wright, S., & Pickton, D. (2010). Competitive intelligence programmes for SMEs in France: Evidence of changing attitudes. *Journal of Strategic Marketing*, *18*(7), 523-536.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*, *13*, 290-312

Sobel, M. E. (1986). Some new results on indirect effects and their standard errors in covariance structure models. *Sociological Methodology*, *16*, 159-186.

Sobh, R., & Perry, C. (2006). Research design and data analysis in realism research. *European Journal of Marketing*, *40*(11/12), 1194-1209.

Sommer, D. (2008). Report highlight for market trends: Business intelligence, worldwide, 2008. Retrieved from Gartner database.

Song, X. M., & Parry, M. E. (1996). What separates Japanese new product winners from losers. *Journal of Product Innovation Management: An International Publication of The Product Development & Management Association*, *13*(5), 422-439.

Sparks, B.H. (2014), *The relationship of business intelligence systems to organisational performance benefits: A structural equation modelling of management decision making* (Doctoral dissertation). Capella University, MN.

Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*, *17*(S2), 45-62.

Srinivasan, R., Lilien, G. L., & Rangaswamy, A. (2002). Technological opportunism and radical technology adoption: An application to e-business. *Journal of Marketing*, *66*(3), 47-60.

Steers, R. M. (1975). Problems in the measurement of organizational effectiveness. *Administrative Science Quarterly*, 2 0 ,546-558.

Steers, R. (1977). *Organizational effectiveness: A behavioural view*. The good year series in management and organizations. Santa Monica, CA: Goodyear.

Strassmann, P. A. (1990). *The business value of computers: An executive's guide*. Information Economics Press.

Stratopoulos, T., & Dehning, B. (2000). Does successful investment in information technology solve the productivity paradox? *Information and Management*, *38*(2), 103-117.

Stuart, T. E. (2000). Inter-organizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry. *Strategic Management Journal*, 2 1 (8), 791-811.

Subramanian, R., & Gopalakrishnan, P. (2001). The Market Orientation - Performance Relationship in The Context of a Developing Economy: An Empirical Analysis. *Journal of Business Research*, *53*(1), 1-13.

Subramanian, R., & Ishak, S. T. (1998). Competitor analysis practices of US companies: An empirical investigation. *MIR: Management International Review*, 7-23.

Subramanian, R., Kumar, K., & Strandholm, K. (2009). The relationship between market orientation and performance under different environmental conditions: the moderating effect of the top management team's risk-taking behaviour. *Academy of Strategic Management Journal* 8, 121–135.

Sundqvist, S., Kyläheiko,K., Kuivalainen, O. & Cadogan, J.W. (2012). Kirznerian and Schumpeterian entrepreneurial-oriented behaviour in turbulent export markets. *International Marketing Review, 29*(4), 494-509.

Suratno, L. S. W. (2013). Improving the Performance of National Banking Business in Indonesia. *International Journal of Innovations in Business*, *2*(5), 484.

Sutton, G. (2000). *An Integrated Model of Job Satisfaction: Expectations, Experiences and Psychological Contract Violation* (Doctoral dissertation). Queensland University of Technology.

Sutton, J., (1991). Sunk Costs and Market Structure: Theory and History. *MIT Press*, Cambridge, MA.

Sveiby, K. (2001). What is knowledge management? from http://www.sveiby.com/articles/KnowledgeManagement.html.

Tabachnick, B. G. & L. S. Fidell. (2001). *Using Multivariate Statistics (4th ed.).* Boston: Allyn and Bacon.

Tabachnick, B. G., & Fidell, L. S. (2007). Multivariate analysis of variance and covariance. *Using Multivariate Statistics*, *3*, 402-407.

Tabachnick, B. G., & Fidell, L. S. (2013). Using multivariate statistics (6. bs.).

Tadajewski, M. (2006). The ordering of marketing theory: The influence of McCarthyism and the Cold War. *Marketing Theory*, *6*(2), 163-199.

Tajeddini, K. (2011). The effects of innovativeness on effectiveness and efficiency. *Education, Business and Society: Contemporary Middle Eastern Issues*, *4*(1), 6-18.

Tallon, P. P. (2008). Inside the adaptive enterprise: An information technology capabilities perspective on business process agility. *Information Technology and Management*, 9(1), 21-36

Tallon, P. P., & Kraemer, K. L. (2003). Investigating the relationship between strategic alignment and information technology business value: the discovery of a paradox. In *Creating business value with information technology: Challenges and Solutions* (pp. 1-22). IGI Global.

Tallon P. P. & Pinsonneault, A. (2011). Competing perspectives on the link between strategic information technology alignment and organizational agility: Insights from a mediation model. *MIS Quarterly*, (35:2), pp. 463-486.

Tam, K. Y. (1998). The Impact of information technology investment on firm performance and evaluation: Evidence from newly industrialized economies. *Information Systems Research*, 9 (1), 85-98.

Tanev, S., & Bailetti, T. (2008). Competitive intelligence information and innovation in small Canadian firms. *European Journal of Marketing*, *42*(7/8), 786-803.

Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multi-business firms. *MIS Quarterly*, 29 (2), 311-334.

Tanriverdi, H., & Venkatraman, N. (2005). Knowledge relatedness and the performance of multibusiness firms. *Strategic Management Journal*, *26*(2), 97-119.

Tapscott, D., & Caston, A. (1993). *Paradigm shift: The new promise of information technology* (Vol. 15). New York: McGraw-Hill.

Tarafdar, M., & Gordon, S. R. (2007). Understanding the influence of information systems competencies on process innovation: A resource-based view. *The Journal of Strategic Information Systems*, *16*(4), 353-392.

Tassey, G. (2008). Globalization of technology-based growth: The policy imperative. *The Journal of Technology Transfer*, *33*(6), 560-578.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 15, 285-305.

Teece, D., (2006). Reflections on Profiting from innovation. *Research Policy*, 35, 1131-1146.

Tej Adidam, P., Banerjee, M., & Shukla, P. (2012). Competitive intelligence and firm's performance in emerging markets: an exploratory study in India. *Journal of Business & Industrial Marketing*, *27*(3), 242-254.

Tellis, G. J., & Golder, P. N. (1996). First to market, first to fail? Real causes of enduring market leadership. *MIT Sloan Management Review*, *37*(2), 65-75.

Tellis, G. J., & Golder, P. (2001). *Will and vision: How latecomers grow to dominate markets.* McGraw Hill.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y. M., & Lauro, C. (2005). PLS path modelling. *Computational Statistics and Data Analysis*, *48*(1), 159-205.

Thiesse, F., Staake, T., Schmitt, P., & Fleisch, E. (2011). The rise of the next-generation bar code: an international RFID adoption study. *Supply Chain Management: An International Journal*, *16*(5), 328-345.

Thompson, O. (2004). Business intelligence success, lessons learned. *Technology*.

Thompson, M. P., & Walsham, G. (2004). Placing knowledge management in context. *Journal of Management Studies*, *41*(5), 725-747.

Thonrnhill, S. (2006). Knowledge, innovation and firm performance in high and low technology regimes. *Journal of Business Venturing*, 21, pp. 687-703.

Tidd, J., & Bessant, J. R. (2018). *Managing innovation: Integrating technological, market and organizational change*. John Wiley & Sons.

Tinnilä M. & Vepsäläinen, A. P. J. (1995). A model for strategic repositioning of service processes. *International Journal of Service Industry Management*, 6(4), 57-80.

Tiwana, A. & Konsynski, B. (2010). Complementarities between organizational information technology architecture and governance structure. *Information Systems Research*, (21:2), pp. 280-304.

Tobi, S. U. M. (2013). Research methodological cage: Understanding the qualitative viewpoint.

Tödtling, F., Lehner, P., & Kaufmann, A. (2009). Do different types of innovation rely on specific kinds of knowledge interactions? *Technovation*, *29*(1), 59-71.

Tosi, L., & Locum, J.W.J. (1984). Contingency Theory: Some Suggested Directions. *Journal of Management*, 10(1), 9-26.

Trajtenberg, M. (1990). A penny for your quotes: Patent citations and the value of innovations. *Rand Journal of Economics*, 2 1(1), 172-187.

Trkman, P., McCormack, K., Oliveira, M.P.V., & Ladeira, M.B. (2010). the impact of business analytics on supply chain performance. *Decision Support Systems*. (49), pp. 318-327.

Tsai, K. H., & Yang, S. Y. (2013). Firm innovativeness and business performance: The joint moderating effects of market turbulence and competition. *Industrial Marketing Management*, *42*(8), 1279-1294.

Tsai, K. H., & Yang, S. Y. (2014). The contingent value of firm innovativeness for business performance under environmental turbulence. *International Entrepreneurship and Management Journal*, *10*(2), 343-366.

Tse, A. C. B., Sin, L. Y. M., Yau, O. H. M., Lee, J. S. S., & Chow, R., (2003). Market orientation and business performance in a Chinese business environment, *Journal of Business Research*, Vol. 56: 227-239.

Turban, E., Leidner, D., McLean, E., & Wetherbe, J., (2008). Information technology for management: Transforming organizations in the digital economy. (6th ed.). New Hoboken, NJ: John Wiley & Sons, Inc.

Turban, E., Sharda, R., Aronson, J. E., & King, D. (2008). *Business intelligence: A managerial approach* (pp. 58-59). Upper Saddle River, NJ: Pearson Prentice Hall.

Turulja, L., & Bajgoric, N. (2018). Information technology, knowledge management and human resource management: Investigating mutual interactions towards better organizational performance. *VINE Journal of Information and Knowledge Management Systems*, *48*(2), 255-276.

Tushman, M. L., & Anderson, P. (1986). Technological discontinuities and organizational environments. *Administrative Science Quarterly*, 439-465.

Tushman, N. L. & Nadler, D. A. (1986). Organizing for innovation. *California Management Review*, 28(3), 74-92.

Tyler, B.B., (2001). The Complementarity of Cooperative and Technological Competencies: A Resource Based Perspective. *Journal of Engineering Technology Management*, Vol. 18: 1-27.

Ubiparipović, B., & Đurković, E. (2011). Application of business intelligence in the banking industry. *Management Information System*, *6*(4), 23-30.

Uchupalanan, K. (2000). Competition and IT-based innovation in banking services. *International Journal of Innovation Management*, *4*(04), 455-489.

Urbach, N. & F. Ahlemann. (2010). Structural Equation Modelling in Information Systems Research Using Partial Least Squares. *Journal of Information Technology Theory and Application*, Vol. 11. (2): p.5-40.

Valentinov, V. (2012). System-environment relations in the theories of open and autopoietic system: Implications for critical systems thinking. *Systemic Practice and Action Research*, 25(6), 537-542.

Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Science*, 32(5), 590-607.

Van Maanen, J., & Schein, E. H. (1979). Toward a theory of organizational socialization. In B. M. Staw & L. L. Cummings (Eds), *Research in Organizational Behavior* (Vol. 1, pp. 209-269). Greenwich, CT: JAI Press.

Varis, M., & Littunen, H. (2010). Types of innovation, sources of information and performance in entrepreneurial SMEs. *European Journal of Innovation Management*, *13*(2), 128-154.

Vella, C.M. & McGonagle, J.J. (1986). Just Call Your Computer 007. *Bank Marketing Magazine*, June 36-39.

Venkatraman, N. (1989). The Concept of Fit in Strategy Research: Toward Verbal and Statistical Correspondence. *Academy of Management Review*. Vol. 14: p. 423-444.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *The Academy of Management Review*, 11(4), 810-814.

Venkatraman, N., & Prescott, J. E. (1990). Environment-strategy coalignment: an empirical test of its performance implications. *Strategic Management Journal*, *11*(1), 1-23.

Verhees, F. J., & Meulenberg, M. T. (2004). Market orientation, innovativeness, product innovation, and performance in small firms. *Journal of Small Business Management*, *42*(2), 134-154.

Vermeulen, P., & Dankbaar, B. (2002). The organisation of product innovation in the financial sector. *Service Industries Journal*, *22*(3), 77-98.

Victor, B., Boynton, A., & Stephens, J.T. (2000). The Effective Design of Work Under Total Quality Management. *Organization Science*, Vol. 11: 102-117.

Vilanova, M., Lozano, J. M., & Arenas, D. (2009). Exploring the nature of the relationship between CSR and competitiveness. *Journal of business Ethics*, *87*(1), 57-69.

Viviers, W., Saayman, A., & Muller, M. L. (2005). Enhancing a competitive intelligence culture in South Africa. *International Journal of Social Economics*, *32*(7), 576-589.

Vogt, W. P. (1999) *Dictionary of Statistics and Methodology: A Nontechnical Guide for the Social Sciences*, London: Sage

Von Hippel, E. (1994). “Sticky information” and the locus of problem solving: Implications for innovation. *Management Science*, *40*(4), 429-439.

Von Krogh, G., Ichijo, K., & Nonaka, I. (2000). *Enabling knowledge creation: How to unlock the mystery of tacit knowledge and release the power of innovation*. Oxford University Press on Demand.

Vukšić, V. B., Bach, M. P., & Popovič, A. (2013). Supporting performance management with business process management and business intelligence: A case analysis of integration and orchestration. *International Journal of Information Management*, *33*(4), 613-619.

Wallin, J., Larsson, A., Isaksson, O., & Larsson, T. (2011). Measuring innovation capability assessing collaborative performance in product-service system innovation, *3rd CIRP International Conference on Industrial Product Service Systems*, Braunschweig

Wang, C. L., & Ahmed, P. K. (2004). The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *European Journal of Innovation Management*, *7*(4), 303-313.

Wang, M. C., & Fang, S. C. (2012). The moderating effect of environmental uncertainty on the relationship between network structures and the innovative performance of a new venture. *Journal of Business and Industrial Marketing*, *27*(4), 311-323.

Wang, Y. & X. Zhang. (2009). Operationalization of corporate entrepreneurship and its performance implications in China: An Empirical Study. *Journal of Chinese Entrepreneurship*, Vol. 1. (1): p. 8-20.

Wang, C. H., Chen, K. Y., & Chen, S. C. (2012). Total Quality Management, market orientation and hotel performance: The moderating effects of external environmental factors. *International Journal of Hospitality Management*, *31*(1), 119-129.

Watson, H.J. (2009). Tutorial: business intelligence - past, present, and future. *Communications of the Association for Information Systems* (25), Article 39, pp. 487-510.

Watson, H. J., Goodhue, D. L., & Wixom, B. H. (2002). The benefits of data warehousing: Why some organizations realize exceptional payoffs. *Information and Management* (39:6), pp. 491-502.

Watson, H.J., Wixom, B.H., Hoffer, J.A., Anderson-Lehman, R., & Reynolds, A. M. (2006). Real-time business intelligence: Best practices in Continental Airlines. *Business Intelligence*, 23 (1), 7-18.

Weaver, C., & Leiteritz, R. J. (2005). Our poverty is a world full of dreams: Reforming the World Bank. *Global Governance*, *11*, 369.

Wee, C. H., & Leow, M. L. (1994). Competitive business intelligence in Singapore. *Journal of Strategic Marketing*, *2*(2), 112-139.

Weill, P. (1992). The relationship between investment in information technology and firm performance: A study of the valve manufacturing sector. *Information Systems Research*, *3*(4), 307-333.

Weill, P., & Broadbent, M. (1998). *Leveraging the new infrastructure: How market leaders capitalize on information technology*. Harvard Business Press.

Weiss, A. (2002). A brief guide to competitive intelligence: How to gather and use information on competitors. *Business Information Review*, *19*(2), 39–47. http://doi.org/10.1177/026638202321036222

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5: 171-180.

Wernerfelt, B. (1995). The resource-based view of the firm: Ten years after. *Strategic Management Journal*, *16*(3), 171-174.

White, C. (2004). Now is the right time for real-time BI. *Information Management Magazine*. Retrieved from http://www.dmreview.com.

White, D. J. (2007). Knowledge Sharing in a Human Resource Community of Practice, (May).

Wiggins, T., & Ruefli, R. R. (2005). Schumpeter's ghost: Is hyper competition making the best of times shorter? *Strategic Management Journal*, 26 (9), 887–911.

Winkler, H. (2009). How to improve supply chain flexibility using strategic supply chain networks. *Logistics Research*, *1*(1), 15-25.

Wiklund, J. (1999). The sustainability of the entrepreneurial orientation-performance relationship. *Entrepreneurship Theory & Practice*, 24(1), 37-48.

Wiklund, J., & Shepherd, D. (2005). Entrepreneurial orientation and small business performance: a configurational approach. *Journal of business venturing*, *20*(1), 71-91.

Williams, S. and Williams, N. (2007). *The profit impact of business intelligence*. San Francisco, CA: Morgan Kaufmann.

Wirtz, B. W., Mathieu, A., & Schilke, O. (2007). Strategy in high-velocity environments. *Long Range Planning*, *40*(3), 295-313.

Wise, L. (2007). *Five steps to business intelligence project success*. Technology Evaluation Centers.

Wisner, J. D. (2003). A structural equation model of supply chain management strategies and firm performance. *Journal of Business Logistics*, *24*(1), 1-26.

Wixom, B. & Watson, H.J. (2010). The BI-Based Organization. *International Journal of Business Intelligence Research* (1:1), pp. 13-28

Wolfe, R. A. (1994). Organizational innovation: Review, critique and suggested research directions. *Journal of Management Studies*, 31(3), 405-431.

Wong, W. K., Kao, B., Cheung, D. W. L., Li, R., & Yiu, S. M. (2014, June). Secure query processing with data interoperability in a cloud database environment. In *Proceedings of the 2014 ACM SIGMOD International Conference on Management of Data* (pp. 1395-1406). ACM.

Wong, S. Y., & Chin, K. S. (2007). Organizational innovation management: An organization-wide perspective. *Industrial Management and Data Systems*, *107*(9), 1290-1315.

Wooldridge, B., & Floyd, S. (1990). The strategy process, middle management involvement, and organizational performance. *Strategic Management Journal*, 11, 231-241.

Wright, S. (2011). *A critical evaluation of competitive intelligence and insight management practice*.

Wright, S., Bisson, C., & Duffy, A. P. (2012). Applying a behavioural and operational diagnostic typology of competitive intelligence practice: empirical evidence from the SME sector in Turkey. *Journal of Strategic Marketing*, *20*(1), 19-33.

Wright, S., Eid, E. R., & Fleisher, C. S. (2009). Empirical study of competitive intelligence practice: Evidence from UK retail banking. Retrieved from https://www.dora.dmu.ac.uk/xmlui/handle/2086/4516.

Wu, I. L., & Chen, J. L. (2014). Knowledge management driven firm performance: The roles of business process capabilities and organizational learning. *Journal of Knowledge Management*, *18*(6), 1141-1164.

Xheneti, M. & Bartlett, W. (2012). Institutional constraints and SME growth in postcommunist Albania. *Journal of Small Business and Enterprise Development, 19*(4), 607 – 626

Xu, H., Teo, H. H., & Tan, B. (2005). Predicting the adoption of location-based services: the role of trust and perceived privacy risk. *ICIS 2005 proceedings*, 71.

Yam, Richard C.M., William Lo, Esther P.Y. Tang & Antonio, K.W. Lau. (2010). Technological Innovation Capabilities and Firm Performance, World Academy of

Science, Engineering and Technology. http://waset.org/journals/waset/v66/v66-164.pdf(21.04.2010)

Yang, L. R., Chen, J. H., & Wang, H. W. (2012). Assessing impacts of information technology on project success through knowledge management practice. *Automation in Construction*, *22*, 182-191.

Yeoh, W. & Koronios, A. (2010). Critical success factors for business intelligence systems. *Journal of Computer Information Systems*, pp. 23-32.

Yeoh, W., Koronios, A., & Gao, J. (2008). Managing the implementation of business intelligence systems: a critical success factors framework. *International Journal of Enterprise Information Systems (IJEIS)*, *4*(3), 79-94.

Yeşil, S., Koska, A., & Büyükbeşe, T. (2013). Knowledge sharing process, innovation capability and innovation performance: an empirical study. *Procedia-Social and Behavioral Sciences*, *75*, 217-225.

Yoo, S.-J. 2001. Entrepreneurial orientation, environment scanning intensity, and firm performance in technology-based SMEs. In W.D. Bygrave, C.G. Brush, P. Davidsson, G.P. Green, P.D. Reynolds & H.J.Sapienca (Eds.) (Eds.), Frontiers of Entrepreneurship Research (pp. pp. 365–367). Wellesley, MA: Babson College.

Yuchtman, E., & Seashore, S. E. (1967). A system resource approach to organizational effectiveness. *American Sociological Review*, 891-903.

Yusuf, A. (2002). Environmental uncertainty, the entrepreneurial orientation of business ventures and performance. *International Journal of Commerce and Management*, 12, (3&4), 83–103.

Zaefarian, G., Forkmann, S., Mitręga, M., & Henneberg, S. C. (2017). A capability perspective on relationship ending and its impact on product innovation success and firm performance. *Long Range Planning*, *50*(2), 184-199.

Zairi, M. (1994). Innovation or innovativeness? Results of a benchmarking study. *Total Quality Management*, *5*(3), 27-44

Zahra, S. A., & George, G. (2002). The net-enabled business innovation cycle and the evolution of dynamic capabilities. *Information Systems Research*, *13*(2), 147-150.

Zahra, S. A. & J. G. Covin. (1995). Contextual Influences on the Corporate Entrepreneurship Performance Relationship: A Longitudinal Analysis. *Journal of Business Venturing*, Vol. 10: p. 43-58.

Zahra, S. A., & Garvis, D. M. (2000). International corporate entrepreneurship and firm performance: The moderating effect of international environmental hostility. *Journal of Business Venturing*, *15*(5-6), 469-492.

Zahra, S.A., Nielson, A. P. & Bogner, W.C (1999). Corporate entrepreneurship, knowledge and competence development. *Entrepreneurship Theory and Practice*, 23(3), 169-189.

Zaltman, G., Duncan, R., & Holbek, J. (1973). *Innovations and organizations*. John Wiley & Sons.

Zaman Shuva, N. (2005). Implementing information and communication technology in public libraries of Bangladesh. *The International Information and Library Review*, *37*(3), 159-168.

Zhang, J., Li, H., & Ziegelmayer, J. L. (2008). An empirical study of the relationship between IT infrastructure flexibility and IT responsiveness in SMEs: A resource-based analysis. *Proceedings of the Fourteenth Americas Conference on Information Systems*, Toronto, ON, Canada, 1-7.

Zhao, J. L., Tanniru, M., & Zhang, L. J. (2007). Services computing as the foundation of enterprise agility: Overview of recent advances and introduction to the special issue. *Information Systems Frontiers*, *9*(1), 1-8.

Zheng, X., Levine, D., Shen, J., Gogarten, S. M., Laurie, C., & Weir, B. S. (2012). A high-performance computing toolset for relatedness and principal component analysis of SNP data. *Bioinformatics*, *28*(24), 3326-3328.

Zhou, K. Z., Yim, C. K., & Tse, D. K. (2005). The effects of strategic orientations on technology-and market-based breakthrough innovations. *Journal of marketing*, *69*(2), 42-60.

Zhu, K., Kraemer, K., & Xu, S. (2002). A cross-country study of electronic business adoption using the technology-organization-environment framework. *ICIS 2002 Proceedings*, 31.

Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: cross-country evidence from the retail industry. *Information systems research*, *16*(1), 61-84.

Zhuang, Y., & Lederer, A. L. (2003). An instrument for measuring the business benefits of e-commerce retailing. *International Journal of Electronic Commerce*, *7*(3), 65-99.

Zikmund, W. G. (2000). *Business Research Method*. Orlando: The Dryden Press.

Zikmund, W. G. (2003). Sample designs and sampling procedures. *Business research methods*, *7*, 368-400.

Zmud, R. W. (1982). Diffusion of modern software practices: Influence of centralization and formalization. *Management Science*, *28*(12), 1421-1431.

Zott, C. (2003). Dynamic capabilities and the emergence of industry differential firm performance: Insights from a simulation study. *Strategic Management Journal*, Vol. 24. (2): p. 97-125.

Zulu-Chisanga, S., Boso, N., Adeola, O., & Oghazi, P. (2016). Investigating the path from firm innovativeness to financial performance: The roles of new product success, market responsiveness, and environment turbulence. *Journal of Small Business Strategy*, *26*(1), 51-68.

APPENDIX A

Pusat Pengajian
Pengurusan Perniagaan
SCHOOL OF BUSINESS MANAGEMENT
Universiti Utara Malaysia

Assalamu'alaikum and greetings,

Dear Respected Respondent,

Congratulations for being selected as one of our valuable respondents for this research. This questionnaire is part of a PhD research conducted under the supervision of Professor Dr. Rosli Mahmood and Dr. Muhammad Shukri Bakar at the School of Business Management, Universiti Utara Malaysia. The purpose of the research is to explore the relationships between business intelligence, information technology, innovation, competitive environment, and performance of banks in Malaysia. By virtue of your position as a bank branch manager, I am inviting you to participate in this survey.

I would be grateful if you could spend a few minutes to answer to these questions honestly and to the best of your knowledge. There are no correct or incorrect responses to these questions. Your answers are extremely valuable and will contribute greatly to the success of this research. As this research falls within the framework of an academic research, all the information collected will be treated in the strictest confidence. As a token of appreciation, I am pledging **RM3.00 to an orphanage/elderly/education centre** for every completed questionnaire that is returned.

Your kind cooperation and prompt response to fill out this questionnaire is greatly appreciated. Kindly return the completed questionnaire with the attached envelope at your earliest possible.

Thank you very much for your time, cooperation and assistance in this research.

Warm regards,

Anita Binti Ismail, PhD. Candidate
School of Business Management
College of Business
Universiti Utara Malaysia
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RM3.00 to an orphanage/elderly/education centre
for every completed questionnaire that is returned.

DEFINITION OF CONCEPT
Business intelligence systems adoption Business intelligence systems adoption is a wide category of application, technology, and process for gathering, storing, accessing, and analysing data to assist business users in improving performance. *Information technology infrastructure* Information technology infrastructure is the technology architecture formulation to deliver actual competitive benefits for businesses. *Innovation* The development of new products and services in order to achieve performance. *Competitive environment* The level of the unpredictability and highly varied events which occur in the environment in which an industry operates. *Performance* The firm performance's indicators are demonstrated from the aspects of the firm's growth and profitability.

MEASUREMENT SCALE FOR SECTION A, B, C AND D.

Please indicate the most appropriate response of your answer according to this scale:

1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Neither Disagree nor Agree	5 Slightly Agree	6 Agree	7 Strongly Agree

SECTION A: BUSINESS INTELLIGENCE SYSTEMS ADOPTION

No.	**Business Intelligence Systems Adoption** Our organisation adopts	**Scale 1=Strongly Disagree to 7=Strongly Agree**						
1	business intelligence systems to extract values of key performance indicators (KPI).	1	2	3	4	5	6	7
2	business intelligence systems to produce operational reporting.	1	2	3	4	5	6	7

3	business intelligence systems to produce tactical reporting.	1	2	3	4	5	6	7
4	business intelligence systems to produce strategic reporting.	1	2	3	4	5	6	7
5	features of business intelligence systems to compare and contrast different aspects of the data acquired.	1	2	3	4	5	6	7
6	features of business intelligence systems to test out different assumptions against the data acquired.	1	2	3	4	5	6	7
7	features of business intelligence systems to derive insightful conclusions from the data acquired.	1	2	3	4	5	6	7
8	features of business intelligence systems to produce regular standardized reports on key performance indicators.	1	2	3	4	5	6	7
9	features of business intelligence systems to drill down into the data to understand the root causes of exceptions or issues.	1	2	3	4	5	6	7
10	features of business intelligence systems to perform on-the-fly/quick analysis of current and past data acquired.	1	2	3	4	5	6	7
11	features of business intelligence systems to perform functions for querying.	1	2	3	4	5	6	7
12	features of business intelligence systems for making statistical analysis.	1	2	3	4	5	6	7
13	features of business intelligence systems to share insights based on data within the organisation.	1	2	3	4	5	6	7

SECTION B: INFORMATION TECHNOLOGY INFRASTRUCTURE

No.	**Information Technology Infrastructure**	**Scale 1=Strongly Disagree to 7=Strongly Agree**						
1	Our organisation has a high degree of information system interconnectivity (e.g. WAN/LAN).	1	2	3	4	5	6	7
2	The information systems in my organisation are sufficiently flexible to incorporate electronic connections to external stakeholders.	1	2	3	4	5	6	7
3	Remote users can seamlessly access centralized data in our information systems.	1	2	3	4	5	6	7
4	Data is captured and made available accordingly to everyone in the organisation in real time using the on-hand information systems.	1	2	3	4	5	6	7

5	Our software applications can be easily transported and used across multiple information system platforms.	1	2	3	4	5	6	7
6	Our information system user interfaces provide transparent access to all platforms and applications.	1	2	3	4	5	6	7
7	Our organisation offers multiple information system interfaces or entry points (e.g. web access) to external users accordingly.	1	2	3	4	5	6	7
8	Our organisation makes extensive use of information system middleware to integrate key enterprise applications in business operation.	1	2	3	4	5	6	7
9	The interdependencies of software/hardware components are well-understood in my organisation.	1	2	3	4	5	6	7
10	Information technology standards are well established at the enterprise-wide level in my organisation.	1	2	3	4	5	6	7
11	Information technology polices are well established and implemented at the enterprise-wide level in my organisation.	1	2	3	4	5	6	7
12	Information technology architecture is well established at the enterprise-wide level in my organisation.	1	2	3	4	5	6	7
13	Compliance procedures for information technology infrastructure are well established at the enterprise-wide level in my organisation.	1	2	3	4	5	6	7

SECTION C: INNOVATION

No.	Our organisation has often	**Scale 1=Strongly Disagree to 7=Strongly Agree**						
1	developing new processes.	1	2	3	4	5	6	7
2	customer information inquiry and consultation.	1	2	3	4	5	6	7
3	internal administration and operations.	1	2	3	4	5	6	7
4	developing policies and procedures.	1	2	3	4	5	6	7
5	changing the organisational structure.	1	2	3	4	5	6	7
6	encouraging employees to apply innovative ways to improve work processes.	1	2	3	4	5	6	7
7	revised and improved existing products/services.	1	2	3	4	5	6	7
8	repackaged existing products/services.	1	2	3	4	5	6	7
9	extended the products/services.	1	2	3	4	5	6	7
10	created and established new lines of products/services.	1	2	3	4	5	6	7

11	introduced different technical characteristics or specifications for different products/services.	1	2	3	4	5	6	7
12	offered products/services that are more complex than others which were introduced into the same market.	1	2	3	4	5	6	7

SECTION D: COMPETITIVE ENVIRONMENT

No.	**Competitive Environment**	**Scale 1=Strongly Disagree to 7=Strongly Agree**						
1	The environmental turbulence in our industry is high.	1	2	3	4	5	6	7
2	New product/service introductions are very frequent in this industry.	1	2	3	4	5	6	7
3	There are many competitors in this industry.	1	2	3	4	5	6	7
4	The environment in our industry is continuously changing.	1	2	3	4	5	6	7
5	Environmental forecasts in our industry are very difficult to predict.	1	2	3	4	5	6	7
6	In our line of business, customer preference changes quite a lot over time.	1	2	3	4	5	6	7
7	Our customers tend to look for new products/services all the time.	1	2	3	4	5	6	7
8	The technology in our industry is changing rapidly.	1	2	3	4	5	6	7
9	Technological changes provide big opportunities in our industry.	1	2	3	4	5	6	7
10	A large number of new products/services have been made possible through technological breakthroughs in our industry.	1	2	3	4	5	6	7
11	Technological developments in our industry are rather major.	1	2	3	4	5	6	7
12	The technology in our industry produces better, faster, and cheaper products and services.	1	2	3	4	5	6	7

MEASUREMENT SCALE FOR SECTION E.

Please indicate the most appropriate response of your answer according to this scale:

1 Extremely Low	**2 Low**	**3 Slightly Low**	**4 Neither Low nor High**	**5 Slightly High**	**6 High**	**7 Extremely High**

SECTION E: ORGANISATIONAL PERFORMANCE

No.	**Organisational Performance** Please assess, to the best of your knowledge, your organisational performance in the following areas:	**Scale 1=Extremely Low to 7=Extremely High**						
1	Improved productivity	1	2	3	4	5	6	7
2	Improved competitive position	1	2	3	4	5	6	7
3	Increase in sales	1	2	3	4	5	6	7
4	Increase in profitability	1	2	3	4	5	6	7
5	Improved overall performance	1	2	3	4	5	6	7

SECTION F: DEMOGRAPHIC PROFILE

Type of Bank:			
Islamic Bank	☐	Conventional Bank	☐
Development Financial Institutions	☐		
Types of Services Offered:			
Islamic Bank Facilities	☐	Conventional Bank Facilities	☐
Majority Ownership of Bank:			
Local Bank	☐	Foreign Bank	☐
Number of Employees in your Branch:			
10 and below	☐	11 - 20	☐
21 - 30	☐	31 - 40	☐
41 - 50	☐	51 and above	☐

We thank you for your time and effort to complete this questionnaire.

APPENDIX B

Letter of Recommendation for Data Collection and Research Work

OTHMAN YEOP ABDULLAH
GRADUATE SCHOOL OF BUSINESS
Universiti Utara Malaysia
06010 UUM SINTOK
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"MUAFAKAT KEDAH"

UUM/OYAGSB/R-4/4/1
21 December 2016

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF RECOMMENDATION FOR DATA COLLECTION AND RESEARCH WORK

This is to certify that **Anita Binti Ismail (Matric No: 95704)** is a student of Othman Yeop Abdullah Graduate School of Business, Universiti Utara Malaysia persuing her Doctor of Philosophy (PhD). She is conducting a research entitled ***"Business Intelligence and Information Technology : Relationship With Innovation Competitive Environment and Performance in Malaysian Bank Institution"*** under the supervision of Dr. Muhammad Shukri Bin Bakar.

In this regard, we hope that you could kindly provide assistance and cooperation for him to successfully complete the research. All the information gathered will be strictly used for academic purposes only.

Your cooperation and assistance is very much appreciated.

Thank you.

"BERKHIDMAT UNTUK NEGARA"
"ILMU, BUDI, BAKTI"

Yours faithfully

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